



Open Source Used In Cisco Meeting Server (formerly Acano Server) 3.4

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/Bootstrap.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/MultithreadEventLoopGroup.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalAddress.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelConfig.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/AbstractOioChannel.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/package-info.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPipelineException.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalChannel.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/VoidChannelPromise.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractChannel.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ServerBootstrap.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/FailedChannelFuture.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedEventLoop.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractServerChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundHandler.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioDatagramChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelPipeline.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractChannelHandlerContext.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/CompleteChannelFuture.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ThreadPerChannelEventLoopGroup.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ThreadPerChannelEventLoop.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DefaultDatagramChannelConfig.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelInboundHandler.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOption.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioServerSocketChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ServerChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelMetadata.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ServerSocketChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/CombinedChannelDuplexHandler.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioSocketChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPipeline.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/ProtocolFamilyConverter.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/AbstractNioChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/CombinedIterator.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/OioEventLoopGroup.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/AbstractNioByteChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelInputShutdownEvent.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/NioTask.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/DefaultChannelGroupFuture.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandlerContext.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelInitializer.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/EventLoopException.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedSocketAddress.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultEventLoop.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/FixedRecvByteBufAllocator.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/SocketChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioDatagramChannel.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/FileRegion.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultFileRegion.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/NioEventLoopGroup.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroupFutureListener.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/EventLoop.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroupFuture.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/SucceededChannelFuture.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelFutureListener.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPromise.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundHandlerAdapter.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelPromise.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ServerSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalEventLoopGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DatagramChannelConfig.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-

jar/io/netty/channel/PendingBytesTracker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/oio/DefaultOioDatagramChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DelegatingChannelPromiseNotifier.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/bootstrap/FailedChannel.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/ChannelOutputShutdownEvent.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/internal/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/nio/SelectedSelectionKeySetSelector.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/oio/OioDatagramChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/ChannelInputShutdownReadComplete.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/internal/ChannelUtils.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/ChannelOutputShutdownException.java
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jar/io/netty/channel/CoalescingBufferQueue.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandlerMask.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ExtendedClosedChannelException.java

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* under the License.
*/
/**
* Handles an I/O event or intercepts an I/O operation, and forwards it to its next handler in
* its { @link ChannelPipeline }.
*
* <h3>Sub-types</h3>
* <p>
* { @link ChannelHandler } itself does not provide many methods, but you usually have to implement one of its
* subtypes:
* <ul>
* <li>{ @link ChannelInboundHandler } to handle inbound I/O events, and</li>
* <li>{ @link ChannelOutboundHandler } to handle outbound I/O operations.</li>
* </ul>
* </p>
* <p>
* Alternatively, the following adapter classes are provided for your convenience:
* <ul>
* <li>{ @link ChannelInboundHandlerAdapter } to handle inbound I/O events,</li>
* <li>{ @link ChannelOutboundHandlerAdapter } to handle outbound I/O operations, and</li>
* <li>{ @link ChannelDuplexHandler } to handle both inbound and outbound events</li>
* </ul>
* </p>
* <p>
* For more information, please refer to the documentation of each subtype.
* </p>
*
* <h3>The context object</h3>
* <p>
* A { @link ChannelHandler } is provided with a { @link ChannelHandlerContext }
* object. A { @link ChannelHandler } is supposed to interact with the
* { @link ChannelPipeline } it belongs to via a context object. Using the
* context object, the { @link ChannelHandler } can pass events upstream or
* downstream, modify the pipeline dynamically, or store the information
* (using { @link AttributeKey }s) which is specific to the handler.
*
* <h3>State management</h3>
*
* A { @link ChannelHandler } often needs to store some stateful information.
* The simplest and recommended approach is to use member variables:
* <pre>

```



```

* public interface Message {
*     // your methods here
* }
*
* public class DataServerHandler extends { @link SimpleChannelInboundHandler } &lt; Message &gt; {
*
*     <b>private boolean loggedIn;</b>
*
*     { @code @Override }
*     public void channelRead0({ @link ChannelHandlerContext } ctx, Message message) {
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) message);
*             <b>loggedIn = true;</b>
*         } else (message instanceof GetDataMessage) {
*             if (<b>loggedIn</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) message));
*             } else {
*                 fail();
*             }
*         }
*     }
*     ...
* }
* </pre>

```

* Because the handler instance has a state variable which is dedicated to
 * one connection, you have to create a new handler instance for each new
 * channel to avoid a race condition where a unauthenticated client can get
 * the confidential information:

```

* <pre>
* // Create a new handler instance per channel.
* // See { @link ChannelInitializer#initChannel(Channel) }.
* public class DataServerInitializer extends { @link ChannelInitializer } &lt; { @link Channel } &gt; {
*     { @code @Override }
*     public void initChannel({ @link Channel } channel) {
*         channel.pipeline().addLast("handler", <b>new DataServerHandler()</b>);
*     }
* }
* </pre>

```

* <h4>Using { @link AttributeKey }s</h4>

* Although it's recommended to use member variables to store the state of a
 * handler, for some reason you might not want to create many handler instances.
 * In such a case, you can use { @link AttributeKey }s which is provided by
 * { @link ChannelHandlerContext }:

```

* <pre>
* public interface Message {

```

```

* // your methods here
* }
*
* { @code @Sharable }
* public class DataServerHandler extends { @link SimpleChannelInboundHandler } &lt; Message &gt; {
*     private final { @link AttributeKey } &lt; { @link Boolean } &gt;; auth =
*         { @link AttributeKey #valueOf(String) AttributeKey.valueOf("auth") };
*
*     { @code @Override }
*     public void channelRead({ @link ChannelHandlerContext } ctx, Message message) {
*         { @link Attribute } &lt; { @link Boolean } &gt;; attr = ctx.attr(auth);
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) o);
*             <b>attr.set(true)</b>;
*         } else (message instanceof GetDataMessage) {
*             if (<b>Boolean.TRUE.equals(attr.get())</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) o));
*             } else {
*                 fail();
*             }
*         }
*     }
* }
* ...
* }
* </pre>

```

* Now that the state of the handler is attached to the { @link ChannelHandlerContext }, you can add the same handler instance to different pipelines:

```

* <pre>
* public class DataServerInitializer extends { @link ChannelInitializer } &lt; { @link Channel } &gt; {
*
*     private static final DataServerHandler <b>SHARED</b> = new DataServerHandler();
*
*     { @code @Override }
*     public void initChannel({ @link Channel } channel) {
*         channel.pipeline().addLast("handler", <b>SHARED</b>);
*     }
* }
* </pre>

```

* <h4>The { @code @Sharable } annotation</h4>

* <p>In the example above which used an { @link AttributeKey }, you might have noticed the { @code @Sharable } annotation.

* <p>If a { @link ChannelHandler } is annotated with the { @code @Sharable } annotation, it means you can create an instance of the handler just once and add it to one or more { @link ChannelPipeline }s multiple times without

- * a race condition.
- * <p>
- * If this annotation is not specified, you have to create a new handler
- * instance every time you add it to a pipeline because it has unshared state
- * such as member variables.
- * <p>
- * This annotation is provided for documentation purpose, just like
- * the JCIP annotations.
- * </h3>Additional resources worth reading</h3>
- * <p>
- * Please refer to the { @link ChannelHandler}, and
- * { @link ChannelPipeline} to find out more about inbound and outbound operations,
- * what fundamental differences they have, how they flow in a pipeline, and how to handle
- * the operation in your application.
- */

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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandler.java

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- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioChannelOption.java
- * /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/SimpleUserEventChannelHandler.java

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jar/io/netty/channel/AbstractCoalescingBufferQueue.java

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jar/io/netty/channel/DefaultMessageSizeEstimator.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelHandlerAdapter.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/DefaultChannelGroup.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultAddressedEnvelope.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelProgressivePromise.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/ChannelGroupException.java

* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-

jar/io/netty/channel/ChannelOutboundBuffer.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelId.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/MessageSizeEstimator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/AbstractEventLoopGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/ChannelGroup.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultChannelId.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/ChannelMatcher.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/oio/DefaultOioSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/group/ChannelMatchers.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ConnectTimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/bootstrap/ChannelFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/oio/OioServerSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/AddressedEnvelope.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelProgressiveFutureListener.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
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jar/io/netty/channel/ChannelProgressiveFuture.java
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jar/io/netty/channel/SimpleChannelInboundHandler.java
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jar/io/netty/channel/DefaultChannelProgressivePromise.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/socket/oio/DefaultOioServerSocketChannelConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/nio/SelectedSelectionKeySet.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelFactory.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedChannelId.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractEventLoop.java
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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/AbstractChannelPoolHandler.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-

jar/io/netty/channel/DefaultMaxBytesRecvByteBufAllocator.java
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jar/io/netty/channel/pool/ChannelPoolMap.java
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jar/io/netty/channel/pool/ChannelPoolHandler.java
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jar/io/netty/channel/pool/ChannelPool.java
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jar/io/netty/channel/pool/FixedChannelPool.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/pool/AbstractChannelPoolMap.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/pool/ChannelHealthChecker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/MaxBytesRecvByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
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jar/io/netty/channel/socket/DuplexChannel.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/ChannelOutboundInvoker.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/WriteBufferWaterMark.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-
jar/io/netty/channel/DefaultSelectStrategyFactory.java
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jar/io/netty/channel/group/VoidChannelGroupFuture.java

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* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/BootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ServerBootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/AbstractBootstrapConfig.java
* /opt/ws_local/PERMITS_SQL/1072948476_1595240756.51/0/netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultSelectStrategy.java
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```
# This is the official list of people who can contribute
# (and typically have contributed) code to the Go repository.
# The AUTHORS file lists the copyright holders; this file
# lists people. For example, Google employees are listed here
# but not in AUTHORS, because Google holds the copyright.
#
# Names should be added to this file only after verifying that
# the individual or the individual's organization has agreed to
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# http://code.google.com/legal/individual-cla-v1.0.html
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#
# The agreement for individuals can be filled out on the web.

# Names should be added to this file like so:
# Individual's name <submission email address>
# Individual's name <submission email address> <email2> <emailN>
#
# An entry with multiple email addresses specifies that the
# first address should be used in the submit logs and
# that the other addresses should be recognized as the
# same person when interacting with Gerrit.

# Please keep the list sorted.

Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
```

Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>
Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Petel <peteladrien@gmail.com>
Acio Jnior <aeciodantasjunior@gmail.com>
Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmetb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>
Ahmy Yulrizka <yulrizka@gmail.com>
Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <contact@akhilindurti.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>

Albert Nigmatzianov <albertnigma@gmail.com>
Albert Strasheim <fullung@gmail.com>
Albert Teoh <albert.teoh@gmail.com>
Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>
Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex Sergeyev <abc@alexsergeyev.com>
Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumpem.de>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandre Cesaro <alexandre.cesaro@gmail.com>

Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>

Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Lutomirski <andy@luto.us>
Andrew Pilloud <andrewpilloud@igneoussystems.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <ality@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>

Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Arash Bina <arash@arash.io>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayanamist Yang <ayanamist@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Bartosz Grzybowski <melkorm@gmail.com>

Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunonet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>

Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradley Falzon <brad@teambrad.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Ryan <bjryan19@gmail.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkenedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Souza <carloshrsouza@gmail.com>

Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Channing Kimble-Brown <channing@golang.org>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Cherry Zhang <cherryyz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>

Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clment Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damiens.lespiau@gmail.com> <damiens.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damiens@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>

Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Koliustratova <daria.koliustratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Chase <drchase@google.com>

David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskiy <honsiorovskiy@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>

Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdudd Jadhav <dhrvdudd.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Teaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>

Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliet <efliet@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rykwalder <e.rykwalder@gmail.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>

Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Polyakov <zbr@iorem.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>

Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@aurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>

GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @frennie (6499251) <mail@rhab.de>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @OlgaVIPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Choroma194@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <53217283+utkarsh-extc@users.noreply.github.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>

Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>

Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>

Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchiy <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>

Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Culp <jculp14@gmail.com>
Jaroslavas Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>

Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londdevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>

Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>

Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jos Visser <josv@google.com>
Jose Luis Vzquez Gonzlez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhaug <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>

Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kelly Heller <pestophagous@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevin Ballard <kevin@sb.org>

Kevin Burke <kev@inburke.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Krylo Silin <silin@krylo.org>
L Campbell <unpansu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>

Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Lion Yang <lion@aosc.xyz>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>

Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>

Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>

Matt Layher <mdlayher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorner.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>

Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>

Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactapus@gmail.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>

Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>

Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogsoft.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorphus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>

Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Peter Surnyi <speter.go1@gmail.com>
Peter Szab <pts@google.com>
Peter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>

Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.brgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@helloworld.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Pontus Leitzler <leitzler@gmail.com>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Varanasi <prashant@prashantv.com>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quinn Slack <sq@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>

Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelm <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Rodolfo Carvalho <rhcarvalho@gmail.com>

Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Verma <rohanverma2004@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <rui@uoyou.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrd@b@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Ding <samding@ca.ibm.com>

Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'SnakE' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>

Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shaozhen Ding <dsz0111@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <selliot@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zsj950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Rensus <srenatus@chef.io>

Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>

Tal Shprecher <tshprecher@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>

Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <oohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>

Tyler Treat <ttreat31@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgrriffel@gmail.com>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>

Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xing Xing <mikespook@gmail.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherv@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <yylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>

Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
<a.maksadbek@gmail.com>
<max.faceless.frei@gmail.com>
<hagen1778@gmail.com>
<tbunyk@gmail.com>
<faxriddinjon@gmail.com>
<zs349596@gmail.com>
<bronze1man@gmail.com>

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1.4 aspect-j 1.9.6

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1.5 docker v19.03.5

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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1.6 junixsocket-common 2.3.2

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- * /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-jar/org/newsclub/net/unix/Closeables.java
- * /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-jar/org/newsclub/net/unix/AFUNIXSocket.java
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- * /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-jar/org/newsclub/net/unix/AFUNIXSocketImpl.java
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- * /opt/ws_local/PERMITS_SQL/1046144794_1589880088.21/0/junixsocket-common-2-3-2-sources-jar/org/newsclub/net/unix/AFUNIXSocketFactory.java

1.7 nghttp2 1.40.0-1build1

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set yrange [0:]

set terminal pngcairo font 'Sans, 8' lw 1 size 1400,1024

set xtics rotate by -45

set style histogram errorbars gap 2 lw 1

set style fill solid border -1

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1.8 cryptsetup 1.7.2

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1.9 pam 1.3.1-5ubuntu4.3

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1.13 dom4j 2.1.3

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* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
 jar/org/dom4j/tree/ElementQNameIterator.java
 * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
 jar/org/dom4j/tree/ElementIterator.java
 * /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
 jar/org/dom4j/ElementHandler.java
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* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/SimpleSingleton.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/NonLazyDocumentFactory.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/DatatypeAttribute.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultEntity.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractDocument.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/QNameCache.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractNode.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/jaxb/JAXBRuntimeException.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/IndexedDocumentFactory.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractBranch.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/HTMLWriter.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dtd/InternalEntityDecl.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMDocumentFactory.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/DatatypeElementFactory.java

* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultComment.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMCDATA.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/swing/BranchTreeNode.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXModifier.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/swing/LeafTreeNode.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMNodeHelper.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/jaxb/JAXBObjectModifier.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/jaxb/JAXBReader.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/ElementModifier.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMAttributeNodeMap.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/XMLResult.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXModifyReader.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/xpp/ProxyXmlStartTag.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dtd/AttributeDecl.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DocumentInputSource.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/STAXEventReader.java
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* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/SingletonStrategy.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractDocumentType.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/DocumentException.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractText.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMNamespace.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultDocumentType.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXModifyException.java

* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMDocument.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractElement.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/UserDataDocumentFactory.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/XPPReader.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultAttribute.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/OutputFormat.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/NamedTypeResolver.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/SingleIterator.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMAttribute.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/rule/RuleManager.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultElement.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/InvalidSchemaException.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/xpath/DefaultNamespaceContext.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/DatatypeElement.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DocumentSource.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/ElementNameIterator.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DOMSAXContentHandler.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMElement.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/JAXPHelper.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/rule/RuleSet.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Branch.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/Text.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DOMDocumentResult.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/datatype/SchemaParser.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/DispatchHandler.java

* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/io/SAXModifyContentHandler.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/AbstractComment.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/util/AttributeHelper.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultText.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultNamespace.java
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jar/org/dom4j/DocumentHelper.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
jar/org/dom4j/io/SAXReader.java
* /opt/ws_local/PERMITS_SQL/1034543185_1588830303.8/0/dom4j-2-1-3-sources-
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1.14 gnulib 2019-09-23

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Files:

tests/test-update-copyright.sh

Depends-on:

configure.ac:

```
abs_aux_dir=`cd "$ac_aux_dir"; pwd`  
AC_SUBST([abs_aux_dir])
```

Makefile.am:

```
TESTS += test-update-copyright.sh  
TESTS_ENVIRONMENT += abs_aux_dir='${abs_aux_dir}'  
@c The GNU Lesser General Public License.  
@center Version 2.1, February 1999
```

```
@c This file is intended to be included within another document,  
@c hence no sectioning command or @node.
```

```
@display
```

```
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```

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

@item

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

@item

A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a ``work that uses the Library''. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a ``work that uses the Library'' with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a ``work that uses the library''. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a ``work that uses the Library'' uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

@item

As an exception to the Sections above, you may also combine or link a ``work that uses the Library'' with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the

Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

@enumerate a

@item

Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable ``work that uses the Library'', as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

@item

Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

@item

Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

@item

If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

@item

Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

@end enumerate

For an executable, the required form of the ``work that uses the Library'' must include any data and utility programs needed for

reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

@item

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@enumerate a

@item

Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

@item

Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

@end enumerate

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@end enumerate

@subheading END OF TERMS AND CONDITIONS

@page

@subheading How to Apply These Terms to Your New Libraries

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To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the ``copyright" line and a pointer to where the full notice is found.

@smallexample

@var{one line to give the library's name and an idea of what it does.}

Copyright (C) @var{year} @var{name of author}

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

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You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.

@end smallexample

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your

school, if any, to sign a ``copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
@smallexample
```

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the library
`Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
@var{signature of Ty Coon}, 1 April 1990
```

```
Ty Coon, President of Vice
```

```
@end smallexample
```

That's all there is to it!

Files:

```
tests/test-canonicalize-lgpl.c
```

```
tests/signature.h
```

```
tests/null-ptr.h
```

```
tests/macros.h
```

Depends-on:

```
ignore-value
```

```
same-inode
```

```
symlink
```

configure.ac:

Makefile.am:

```
TESTS += test-canonicalize-lgpl
```

```
check_PROGRAMS += test-canonicalize-lgpl
```

```
$Id: COPYING,v 1.3 2006-10-26 16:20:28 eggert Exp $
```

```
The files in here are mostly copyright (C) Free Software Foundation, and
are under assorted licenses. Mostly, but not entirely, GPL.
```

Many modules are provided dual-license, either GPL or LGPL at your option. The headers of files in the lib directory (e.g., lib/error.c) state GPL for convenience, since the bulk of current gnuilib users are GPL'd programs. But the files in the modules directory (e.g., modules/error) state the true license of each file, and when you use 'gnuilib-tool --lgpl --import <modules>', gnuilib-tool either rewrites the files to have an LGPL header as part of copying them from gnuilib to your project directory, or fails because the modules you requested were not licensed under LGPL.

Some of the source files in lib/ have different licenses. Also, the copy of maintain.texi in doc/ has a verbatim-copying license, and doc/standards.texi and make-stds.texi are GFDL. Most (but not all) m4/*.m4 files have nearly unlimited licenses.

```
@c The GNU General Public License.
```

```
@center Version 2, June 1991
```

@c This file is intended to be included within another document,
@c hence no sectioning command or @node.

@display

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@enumerate 0

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@enumerate a

@item

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@item

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If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

@end enumerate

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@enumerate a

@item

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@item

Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

@item

Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

@end enumerate

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@ifinfo

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@end enumerate

@iftex

@heading END OF TERMS AND CONDITIONS

@end iftex

@ifinfo

@center END OF TERMS AND CONDITIONS

@end ifinfo

@page

@heading Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the ``copyright" line and a pointer to where the full notice is found.

@smallexample

@var{one line to give the program's name and a brief idea of what it does.}

Copyright (C) @var{yyyy} @var{name of author}

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.
@end smallexample

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
@smallexample
Gnomovision version 69, Copyright (C) @var{year} @var{name of author}
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
@end smallexample
```

The hypothetical commands @samp{show w} and @samp{show c} should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than @samp{show w} and @samp{show c}; they could even be mouse-clicks or menu items---whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a ``copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

```
@example
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
@var{signature of Ty Coon}, 1 April 1989
Ty Coon, President of Vice
@end example
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may

consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Lesser General Public License instead of this License.

Description:

Concatenate two arbitrary file names.

Files:

lib/filenamecat.h

lib/filenamecat-lgpl.c

m4/filenamecat.m4

Depends-on:

dirname-lgpl

configure.ac:

gl_FILE_NAME_CONCAT_LGPL

Makefile.am:

lib_SOURCES += filenamecat-lgpl.c

Include:

"filenamecat.h"

License:

LGPLv2+

Maintainer:

Jim Meyering

Please email the following information to assign@gnu.org, and we will send you the assignment form for your past and future changes.

Please use your full legal name (in ASCII characters) as the subject line of the message.

REQUEST: SEND FORM FOR PAST AND FUTURE CHANGES

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own your changes? Do you attend a school which might make such a claim?]

[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your postal address here.]

[Which files have you changed so far, and which new files have you written so far?]

Description:

Provide the GNU Free Documentation License in Texinfo format.

Files:

doc/fdl.texi

Depends-on:

configure.ac:

Makefile.am:

Include:

License:

unmodifiable license text

Maintainer:

all

Description:

Help make libraries relocatable, that is, to allow them to function properly when copied to an arbitrary directory.

Files:

doc/relocatable.texi

lib/relocatable.h

lib/relocatable.c

lib/relocatable.valgrind

m4/relocatable-lib.m4

Depends-on:

strdup

```
configure.ac:
gl_RELOCATABLE_LIBRARY
if test $RELOCATABLE = yes; then
  AC_LIBOBJ([relocatable])
fi
```

```
Makefile.am:
DEFS += -DNO_XMALLOC
```

```
Include:
"relocatable.h"
```

```
License:
LGPLv2+
```

```
Maintainer:
Ben Pfaff
```

```
Description:
Ensure getcwd(NULL, 0) returns a buffer allocated by the malloc() function.
```

```
Files:
lib/getcwd-lgpl.c
m4/getcwd.m4
```

```
Depends-on:
unistd
strdup      [test $REPLACE_GETCWD = 1]
```

```
configure.ac:
gl_FUNC_GETCWD_LGPL
if test $REPLACE_GETCWD = 1; then
  AC_LIBOBJ([getcwd-lgpl])
fi
gl_UNISTD_MODULE_INDICATOR([getcwd])
```

```
Makefile.am:
```

```
Include:
<unistd.h>
```

```
License:
LGPLv2+
```

```
Maintainer:
Eric Blake
```

```
Legal Issues about Contributing Code to GNU last updated 14 July 2015
```

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- * Keep the copyright and release the program yourself under the GNU GPL. (This alternative is too impractical for contributions to a preexisting FSF-copyrighted GNU program.)

- * Put the code in the public domain. Then there is nothing to stop hoarding of modified versions, but we can still use the program in GNU.

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<signature of Mo Ghoul>, 1 April 1987
Mo Ghoul, President of Vice, Digital Simulation Corp.

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Description:

Locating a program in PATH (LGPLed version).

Files:

lib/findprog.h

lib/findprog.c

lib/findprog-lgpl.c

m4/findprog.m4

m4/eaccess.m4

Depends-on:
stdbool
strdup
concat-filename
access
unistd

configure.ac:
gl_FINDPROG
gl_MODULE_INDICATOR([findprog-lgpl])

Makefile.am:
lib_SOURCES += findprog.h findprog.c

Include:
"findprog.h"

License:
LGPLv2+

Maintainer:
all

The files in this directory describe the gnu lib modules.
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```
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```
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```

```
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Files:

tests/test-getcwd-lgpl.c

tests/signature.h

tests/macros.h

Depends-on:

configure.ac:

Makefile.am:

TESTS += test-getcwd-lgpl

check_PROGRAMS += test-getcwd-lgpl

test_getcwd-lgpl_LDADD = \$(LDADD) \$(LIBINTL)

Description:

realpath, canonicalize_file_name: Provide canonical absolute file name

Files:

lib/canonicalize-lgpl.c

m4/canonicalize.m4

m4/double-slash-root.m4

Depends-on:

extensions

stdlib

nocrash

alloca-opt [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

errno [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

lstat [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME
= 1]

malloca [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

memmove [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

pathmax [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

readlink [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

sys_stat [test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test
\$REPLACE_CANONICALIZE_FILE_NAME = 1]

configure.ac:

gl_CANONICALIZE_LGPL

if test \$HAVE_CANONICALIZE_FILE_NAME = 0 || test \$REPLACE_CANONICALIZE_FILE_NAME = 1; then
AC_LIBOBJ([canonicalize-lgpl])

fi

gl_MODULE_INDICATOR([canonicalize-lgpl])

gl_STDLIB_MODULE_INDICATOR([canonicalize_file_name])

gl_STDLIB_MODULE_INDICATOR([realpath])

Makefile.am:

Include:

<stdlib.h>

License:

LGPLv2+

Maintainer:

all

Description:

Extract specific portions of filenames.

Files:

lib/dirname.h

lib/dirname-lgpl.c

lib/basename-lgpl.c

lib/stripslash.c

m4/dirname.m4

Depends-on:

dosname

double-slash-root

malloc-posix

stdbool

configure.ac:

gl_DIRNAME_LGPL

Makefile.am:

lib_SOURCES += dirname-lgpl.c basename-lgpl.c stripslash.c

Include:

"dirname.h"

License:

GPLv2+

Maintainer:

Jim Meyering, Eric Blake

1.15 jaxb-core 2.3.3

1.15.1 Available under license :

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1.16 jakarta-validation-api 2.0.2

1.16.1 Available under license :

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```
/*
 * Jakarta Bean Validation API
 *
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 */
```

Found in path(s):

```
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Validator.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/CascadableDescriptor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintTarget.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/FutureOrPresent.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Null.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidatorContext.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ExecutableDescriptor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/groups/Default.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/MessageInterpolator.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/package-info.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/Unwrapping.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ValueExtractor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraintvalidation/ValidationTarget.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
```

jar/javax/validation/metadata/MethodDescriptor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/package-info.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/UnexpectedTypeException.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/metadata/BeanDescriptor.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/constraints/Digits.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/bootstrap/ProviderSpecificBootstrap.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/valueextraction/UnwrapByDefault.java
* /opt/cola/permits/1135880235_1613624044.2/0/jakarta-validation-api-2-0-2-sources-3-
jar/javax/validation/constraints/NegativeOrZero.java
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Albert Pretorius <pretoalb@gmail.com>

Arne Beer <arne@twobeer.de>
Billy Robert O'Neal III <billy.oneal@gmail.com> <bion@microsoft.com>
Chris Kennelly <ckennelly@google.com> <ckennelly@ckennelly.com>
Christopher Seymour <chris.j.seymour@hotmail.com>
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Dominik Czarnota <dominik.b.czarnota@gmail.com>
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Ismael Jimenez Martinez <ismael.jimenez.martinez@gmail.com>
Jern-Kuan Leong <jernkuan@gmail.com>
JianXiong Zhou <zhoujianxiong2@gmail.com>
Joao Paulo Magalhaes <joaoppmagalhaes@gmail.com>
John Millikin <jmillikin@stripe.com>
Jussi Knuutila <jussi.knuutila@gmail.com>
Kai Wolf <kai.wolf@gmail.com>
Kishan Kumar <kumar.kishan@outlook.com>
Kaito Udagawa <umireon@gmail.com>
Lei Xu <eddyxu@gmail.com>
Matt Clarkson <mattyclarkson@gmail.com>
Maxim Vafin <maxvafin@gmail.com>
Nick Hutchinson <nshutchinson@gmail.com>
Oleksandr Sochka <sasha.sochka@gmail.com>
Pascal Leroy <phl@google.com>
Paul Redmond <paul.redmond@gmail.com>
Pierre Phaneuf <pphaneuf@google.com>
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1.25 reactor-netty 0.9.11.RELEASE

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1.26 keyutils 1.6-6ubuntu1

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```
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```

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```
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989  
Ty Coon, President of Vice
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1.27 spring-data-jpa 2.3.3.RELEASE

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1.28 ehcache-impl 3.8.1

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```
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/portability/SerializerPortability.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/loaderwriter/writebehind/StripedWriteBehind.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapValueHolder.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/copy/ReadWriteCopier.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/Backend.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/loaderwriter/DefaultCacheLoaderWriterProviderFactory.java
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jar/org/ehcache/impl/config/loaderwriter/writebehind/WriteBehindProviderConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/events/StoreEvents.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/persistence/CacheManagerPersistenceConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/config/event/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/offheap/AbstractOffHeapStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/SimpleBackend.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/loaderwriter/LocalWriteBehindLoaderWriterStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-
jar/org/ehcache/impl/internal/events/CacheEventDispatcherFactoryImpl.java
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* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/OffHeapMapStatistics.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/config/builders/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/tiering/TieredStoreProviderFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/resilience/RobustLoaderWriterResilienceStrategy.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/SizedResourcePoolImpl.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/DeleteAllOperation.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/store/BaseStore.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/persistence/DefaultLocalPersistenceService.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/SwitchableEvictionAdvisor.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/LookupOnlyOnHeapKey.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/serialization/LongSerializer.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/util/ThreadFactoryUtil.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/persistence/DefaultDiskResourceServiceFactory.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/event/CacheEventDispatcherFactoryConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/resilience/RobustResilienceStrategy.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/MemorySizeParser.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapKey.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/ResourcePoolsImpl.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/loaderwriter/DefaultCacheLoaderWriterProviderConfiguration.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/ThreadLocalStoreEventDispatcher.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/BaseOnHeapKey.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/persistence/package-info.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/util/ServiceUtil.java
* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/LazyOffHeapValueHolder.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/portability/OffHeapValueHolderPortability.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/event/DefaultCacheEventListenerConfiguration.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/config/builders/UserManagedCacheBuilder.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/copy/DefaultCopyProviderConfiguration.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/disk/DiskWriteThreadPool.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/resilience/AbstractResilienceStrategy.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/store/HashUtils.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/executor/PooledExecutionServiceConfiguration.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/events/CacheEventAdapter.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/disk/OffHeapDiskStoreProviderFactory.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/serialization/CompactJavaSerializer.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/serialization/package-info.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/persistence/DefaultDiskResourceService.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/serialization/TransientStateRepository.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/ClassInstanceConfiguration.java

* /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/store/disk/OffHeapDiskStoreProviderConfiguration.java

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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/tiering/TieredStore.java
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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/disk/factories/EhcachePersistentSegmentFactory.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/HeuristicConfiguration.java
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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/ExecutorUtil.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/TimeSourceServiceFactory.java
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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/BatchOperation.java
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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/loaderwriter/writebehind/DefaultWriteBehindConfiguration.java
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- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/EhcacheOffHeapBackingMap.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/persistence/DefaultPersistenceConfiguration.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/WriteOperation.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/config/event/DefaultEventSourceConfiguration.java
- * /opt/cola/permits/1135872533_1613620997.49/0/ehcache-impl-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/PartitionedUnorderedExecutor.java

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*

* This file is part of the lwIP TCP/IP stack.

*

* Author: Adam Dunkels <adam@sics.se>

*

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Glenn Randers-Pehrson
glennrp at users.sourceforge.net
June 26, 2010

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1.31 jboss-logging 3.4.1.Final

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1.32 postgresql-jdbc 42.2.14

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1.39 ehcache-107 3.8.1

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```
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/config/Jsr107Configuration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107MXBean.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/ListenerResources.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CompleteConfiguration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107Configuration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheManager.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/DefaultJsr107Service.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/DefaultConfigurationResolver.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
```

jar/org/ehcache/jsr107/Eh107ReverseConfiguration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/EventListenerAdaptors.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/config/package-info.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/Js107CacheLoaderWriter.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/CloseUtil.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheLoaderWriterProvider.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-jar/org/ehcache/jsr107/package-
info.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/CacheResources.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Js107Service.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/tck/Eh107MBeanServerBuilder.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107Expiry.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/config/ConfigurationElementState.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/NullCompletionListener.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/EhcacheCachingProvider.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/WrappedCacheLoaderWriter.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/config/Js107CacheConfiguration.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheMXBean.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107IdentityCopier.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheEntryEvent.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/Js107ServiceConfigurationParser.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/EhcacheExpiryWrapper.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheStatisticsMXBean.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/ConfigurationMerger.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/internal/Js107CacheConfigurationParser.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-


```
jar/org/ehcache/jsr107/ExpiryPolicyToEhcacheExpiry.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107Cache.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Unwrap.java
* /opt/cola/permits/1135872828_1613621005.88/0/ehcache-107-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107CacheLoaderWriter.java
```

1.40 flex 2.5.35

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/META-INF/maven/io.netty/netty-resolver/pom.xml
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```
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NoopAddressResolverGroup.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/SimpleNameResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NoopAddressResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NameResolver.java
```

* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/AddressResolverGroup.java

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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/HostsFileEntries.java

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```
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
jar/io/netty/resolver/DefaultNameResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
jar/io/netty/resolver/AbstractAddressResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
jar/io/netty/resolver/HostsFileEntriesResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
jar/io/netty/resolver/InetAddressResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
jar/io/netty/resolver/DefaultHostsFileEntriesResolver.java
* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948623_1595240780.88/0/netty-resolver-4-1-51-final-sources-
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1.43 util-linux 2.28

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*/

NR START END SECTORS SIZE NAME UUID

```
1 32 7679 7648 3.7M 8f8378c0-01
2 7680 16383 8704 4.3M 8f8378c0-02
5 7936 12799 4864 2.4M
6 12544 16127 3584 1.8M
```

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```
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```
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```

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1.44 opencv 4.1.1

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  <_>
  <!-- tree 0 -->
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  <rects>
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  32 4 8 2 3.</_></rects>
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  <!-- tree 2 -->
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```



```

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    <!-- tree 3 -->
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          44 10 4 3 3.</_></rects>
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        <!-- tree 1 -->
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```

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John R. Hauser

2017 February 10

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evisionId;)Ljava/lang/String;->...<init>CircularDependencyHelper.javaCodeLineNumberTableLjava/lang/String;
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/*

* hash.c: chained hash tables

*

* Reference: Your favorite introductory book on algorithms

*

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* \$Id\$

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1.51 jline 3.11.0

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1.52 slf4j-log4j 1.7.30

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1.53 libffi 3.3 4

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1.58 pytest 6.2.1

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslTlsv13X509ExtendedTrustManager.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslKeyMaterialProvider.java

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- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemX509Certificate.java
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- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/X509TrustManagerWrapper.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ConscryptAlpnSslEngine.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/META-INF/maven/io.netty/netty-handler/pom.xml

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolAccessor.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionTicketKey.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNames.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslJavaxX509Certificate.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslContextBuilder.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ClientAuth.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNegotiationHandler.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedStream.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleStateHandler.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/LoggingHandler.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/NotSslRecordException.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslHandler.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedFile.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedNioStream.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/LogLevel.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedWriteHandler.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-

jar/io/netty/handler/stream/ChunkedInput.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/ReadTimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/TimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleStateEvent.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/WriteTimeoutException.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleState.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/WriteTimeoutHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/package-info.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/ReadTimeoutHandler.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedNioFile.java

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 - * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/ByteBufFormat.java
 - * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslHandshakeTimeoutException.java
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- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemReader.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkBaseApplicationProtocolNegotiator.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SniHandler.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslX509Certificate.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Java7SslParametersUtils.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionStats.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkApplicationProtocolNegotiator.java
- * /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslServerContext.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SupportedCipherSuiteFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/package-info.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyNpnSslEngine.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslEngineMap.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslContext.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/SimpleTrustManagerFactory.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/traffic/GlobalChannelTrafficCounter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/BouncyCastleSelfSignedCertGenerator.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNegotiator.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslEngine.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/RuleBasedIpFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnApplicationProtocolNegotiator.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslServerContext.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkDefaultApplicationProtocolNegotiator.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslProvider.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/IdentityCipherSuiteFilter.java

* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/OpenJdkSelfSignedCertGenerator.java

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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/UniqueIpFilter.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolUtil.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpSubnetFilterRule.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRule.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslNpnApplicationProtocolNegotiator.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRuleType.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/AbstractRemoteAddressFilter.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslClientContext.java
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* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSsl.java
* /opt/ws_local/PERMITS_SQL/1072948687_1595240769.66/0/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyAlpnSslEngine.java

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1.61 micrometer-core 1.5.4

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jar/io/micrometer/core/ipc/http/OkHttpSender.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/logging/LoggingRegistryConfig.java
```

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/ReactorNettySender.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/logging/LoggingMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/push/PushRegistryConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/StrongReferenceGaugeFunction.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/HttpSender.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/kafka/KafkaConsumerMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/HttpStatusClass.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/util/NamedThreadFactory.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/util/JsonUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/push/PushMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/MultiGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/ipc/http/URLConnectionSender.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/Timer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimedScheduledExecutorService.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/InstrumentedQueuedThreadPool.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/WarnThenDebugLogger.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/TimedHandler.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimedCallable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/mongodb/MongoMetricsCommandListener.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jvm/JvmMemory.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/internal/TimedRunnable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/mongodb/MongoMetricsConnectionPoolListener.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyServerThreadPoolMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jetty/JettyConnectionMetrics.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/Validated.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/http/package-info.java

* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/httpcomponents/HttpContextUtils.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/config/validate/InvalidReason.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/binder/jpa/HibernateQueryMetrics.java
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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/MeterEquivalence.java
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jar/io/micrometer/core/instrument/config/MissingRequiredConfigurationException.java
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jar/io/micrometer/core/annotation/Timed.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Measurement.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/NoPauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/db/DatabaseTableMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/logging/Log4j2Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/aop/CountedAspect.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/StringEscapeUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/RequiredSearch.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/okhttp3/OkHttpMetricsEventListener.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/ImmutableTag.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/TimedSet.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepLong.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/LongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/BaseUnits.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/MeterPartition.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/composite/CompositeLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisherCommand.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/DistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/aop/TimedAspect.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/PauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/EhCache2Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/Mergeable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/FileDescriptorMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Tags.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Statistic.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/MeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Metrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/Nullable.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/DiskSpaceMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/push/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/logging/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/TimeUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/noop/NoopTimeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/CountingMode.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeMeterRegistry.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/AbstractTimeWindowHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepRegistryConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Meter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeCustomMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeTimeGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmCompilationMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterRegistryConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/SimpleConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/InvalidConfigurationException.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmThreadMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Clock.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/HierarchicalNameMapper.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/JCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/DefaultMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepDouble.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/AbstractCompositeMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/search/MeterNotFoundException.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/UptimeMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramGauges.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/MeterBinder.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/IOUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisherThreadPool.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/db/PostgreSQLDatabaseMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterFilter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/PercentileHistogramBuckets.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepMeasurement.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/system/ProcessorMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/ValueAtPercentile.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/DistributionStatisticConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/FunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Gauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/Histogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/MeterFilterReply.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/CountAtBucket.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/DoubleFormat.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/TimedExecutor.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/StringUtils.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/noop/NoopFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmMemoryMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/Incubating.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/TimeWindowPercentileHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/tomcat/TomcatMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardConfig.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramSnapshot.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/TimedExecutorService.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/HistogramSupport.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/annotation/Counted.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/ClockDriftPauseDetector.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeFunctionCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardRate.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/Search.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/FunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeMeter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/dropwizard/DropwizardGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/JvmGcMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/NonNullFields.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Tag.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/composite/CompositeFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/pause/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/AbstractPartition.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardClock.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/AbstractDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/DefaultLongTaskTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/search/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/hystrix/MicrometerMetricsPublisher.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/cache/HazelcastCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/cumulative/CumulativeFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/config/NamingConvention.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/lang/NonNull.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/logging/LogbackMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/Counter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/ClassLoaderMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/dropwizard/DropwizardCounter.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-

jar/io/micrometer/core/instrument/binder/cache/GuavaCacheMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepFunctionTimer.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jvm/ExecutorServiceMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/internal/DefaultGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/jpa/HibernateMetrics.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/step/StepDistributionSummary.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/noop/NoopGauge.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/distribution/TimeWindowFixedBoundaryHistogram.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/util/package-info.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/simple/package-info.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/instrument/binder/kafka/KafkaStreamsMetrics.java

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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-
jar/io/micrometer/core/util/internal/logging/package-info.java
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* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/Slf4JLoggerFactory.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/InternalLogLevel.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/Slf4JLogger.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/AbstractInternalLogger.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/InternalLoggerFactory.java
* /opt/ws_local/PERMITS_SQL/1089949011_1600184760.1/0/micrometer-core-1-5-4-sources-jar/io/micrometer/core/util/internal/logging/JdkLoggerFactory.java

1.62 py 1.6.0-2.ph3

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Found in path(s):

```

*/opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-
jar/org/reactivestreams/Publisher.java

```

* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-jar/org/reactivestreams/FlowAdapters.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-jar/org/reactivestreams/Processor.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-jar/org/reactivestreams/Subscription.java
* /opt/cola/permits/1135840663_1613613063.73/0/reactive-streams-1-0-3-sources-3-jar/org/reactivestreams/Subscriber.java

1.64 docker 19.03.5-r1

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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1.65 jackson-module-parameter-names 2.11.2

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1.66 @tensorflow/tfjs-backend-wasm 3.11.0

1.66.1 Available under license :

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the specific language governing permissions and\n * limitations under the License.\n *
=====\n *\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CCppType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', //
sliceSize\n 'array', // strides\n 'number' // outId\n]);\n\n function gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}): \n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return
out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmGatherNd(\n xId, CCppType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,
outId);\n\n return out;\n }\n\n export const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n };}\n\n"]}

```
=====\n *\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-  
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet  
wasmGatherNd: (\n  xId: number, dtype: CCppType, indicesId: number, numSlices: number,\n  sliceRank:  
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:  
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n    'number', //  
sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n\n  function gatherNd(args: {backend: BackendWasm,  
inputs: GatherNdInputs}): \n    TensorInfo {\n    const {backend, inputs} = args;\n    const {params, indices} =  
inputs;\n\n    const [resultShape, numSlices, sliceSize, strides] =\n      gather_util.prepareAndValidate(params,  
indices);\n\n    const out = backend.makeOutput(resultShape, params.dtype);\n    if (numSlices === 0) {\n      return  
out;\n    }\n\n    const indicesShape = indices.shape;\n    const sliceRank = indicesShape[indicesShape.length - 1];\n\n    const xData = backend.dataIdMap.get(params.dataId);\n    const xId = xData.id;\n    const indicesData =  
backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const stridesBytes = new  
Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmGatherNd(\n      xId, CCppType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n      stridesBytes,  
outId);\n\n    return out;\n  }\n\n  export const gatherNdConfig: KernelConfig = {\n    kernelName: GatherNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: gatherNd\n  };}\n\n"]}
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherNd.js.map

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```

=====
*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concatImplCPU} from
'./kernel_utils/shared';\n\nimport {identity} from './Identity';\n\nimport {reshape} from './Reshape';\n\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend}
= args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length ===
1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes =
$inputs.map(t => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype ===
'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-
dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than
the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by
collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t},
backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals:
backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concat 2d tensors along axis=1.\n    outShape =\nbackend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat =
inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n\n    const finalOutShape =\nbackend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n    out.shape = finalOutShape;\n    const
outData = backend.dataIdMap.get(out.dataId);\n    outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n    return out;\n  }\n\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n  let sumInnerDims =
0;\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n    sumInnerDims += innerDim;\n    return innerDim;\n  });\n  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n  const outVals = backend.typedArrayFromHeap(out);\n  for (let b = 0; b <
batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const
innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n      outVals.set(vals, outOffset);\n      outOffset += innerDim;\n    }\n  }\n  return
out;\n}\n\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc,\n};\n"}

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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=====\n
*\n\nimport { KernelConfig, KernelFunc, Select, SelectInputs, util } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n
'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: { inputs: SelectInputs, backend:
BackendWasm }) {\n    const { inputs, backend } = args;\n    const { condition, t, e } = inputs;\n    const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId =
backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n    const cRank = condition.shape.length;\n    const tRank =
t.shape.length;\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1 :\n    util.sizeFromShape(t.shape.slice(1));\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export
const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as {}
as KernelFunc,\n    setupFunc: setup\n  };"}]
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Select.js.map

No license file was found, but licenses were detected in source scan.

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License.\n *
=====\n *\nimport * as tf from '@tensorflow/tfjs-core';\nimport {registerBackend, removeBackend, test_util, util} from
'@tensorflow/tfjs-core';\n// tslint:disable-next-line:no-imports-from-dist\nimport {ALL_ENVS, BROWSER_ENVS,

```

describeWithFlags} from '@tensorflow/tfjs-core/dist/jasmine_util';\n\nimport {init, resetWasmPath} from
'./backend_wasm';\nimport {BackendWasm, setWasmPath, setWasmPaths} from './index';\n\n/**\n * Tests specific
to the wasm backend. The name of these tests must start with\n * 'wasm' so that they are always included in the test
runner. See\n * `env.specFilter` in `setup_test.ts` for details.\n */\ndescribeWithFlags('wasm read/write',
ALL_ENVS, () => {\n  it('write and read values', async () => {\n    const x = tf.tensor1d([1, 2, 3]);\n
test_util.expectArraysClose([1, 2, 3], await x.data());\n  });\n\n  it('allocate repetitively and confirm reuse of heap
space', () => {\n    const backend = tf.backend() as BackendWasm;\n    const size = 100;\n    // Allocate for the first
time, record the memory offset and dispose.\n    const t1 = tf.zeros([size]);\n    const memOffset1 =
backend.getMemoryOffset(t1.dataId);\n    t1.dispose();\n\n    // Allocate again and make sure the offset is the same
(memory was reused).\n    const t2 = tf.zeros([size]);\n    const memOffset2 =
backend.getMemoryOffset(t2.dataId);\n    // This should fail in case of a memory leak.\n
expect(memOffset1).toBe(memOffset2);\n  });\n\n  it('allocates buffers with byteOffsets', async () => {\n    const
data = [-0.5, 0.5, 3.14];\n    const buffer = new ArrayBuffer(32);\n    const view = new Float32Array(buffer, 8,
data.length);\n\n    // Write values to buffer.\n    for (let i = 0; i < data.length; ++i) {\n      view[i] = data[i];\n
    }\n\n    const t = tf.tensor(view);\n    // Tensor values should match.\n    test_util.expectArraysClose(await t.data(), view);\n
  });\n\n  describeWithFlags('wasm init', BROWSER_ENVS, () => {\n    beforeEach(() => {\n
registerBackend('wasm-test', async () => {\n      const {wasm} = await init();\n      return new
BackendWasm(wasm);\n    }, 100);\n\n    // Silences backend registration warnings.\n    spyOn(console, 'warn');\n
spyOn(console, 'log');\n  });\n\n  afterEach(() => {\n    resetWasmPath();\n    removeBackend('wasm-test');\n  });\n\n
  it('backend init fails when the path is invalid', async () => {\n    setWasmPath('invalid/path');\n    let wasmPath:
string;\n    const realFetch = fetch;\n    spyOn(self, 'fetch').and.callFake((path: string) => {\n      wasmPath = path;\n
return realFetch(path);\n    });\n    expect(await tf.setBackend('wasm-test')).toBe(false);\n
expect(wasmPath).toBe('invalid/path');\n  });\n\n  it('backend init fails when setWasmPaths is called with '+\n
'an invalid prefix',\n  async () => {\n    setWasmPaths('invalid/prefix/');\n    let wasmPath: string;\n    const
realFetch = fetch;\n    spyOn(self, 'fetch').and.callFake((path: string) => {\n      wasmPath = path;\n      return
realFetch(path);\n    });\n    expect(await tf.setBackend('wasm-test')).toBe(false);\n
expect(wasmPath).toContain('invalid/prefix');\n  });\n\n  it('backend init fails when setWasmPaths is called with '+\n
'an invalid fileMap',\n  async () => {\n    setWasmPaths({\n      'tfjs-backend-wasm.wasm':
'invalid/path',\n      'tfjs-backend-wasm-simd.wasm': 'invalid/path',\n      'tfjs-backend-wasm-threaded-
simd.wasm': 'invalid/path'\n    });\n    let wasmPathPrefix: string;\n    const realFetch = fetch;\n    spyOn(self,
'fetch').and.callFake((path: string) => {\n      wasmPathPrefix = path;\n      return realFetch(path);\n    });\n
expect(await tf.setBackend('wasm-test')).toBe(false);\n    expect(wasmPathPrefix).toBe('invalid/path');\n  });\n\n
  it('setWasmPaths throws error when called without specifying a path for '+\n
'each binary',\n  async () => {\n    expect(() => {\n      setWasmPaths({\n        'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-
wasm.wasm'\n      });\n    }).toThrow();\n  });\n\n  it('backend init works when the path is valid and use
platform fetch',\n  async () => {\n    const usePlatformFetch = true;\n    const validPrefix = '/base/wasm-out';\n
setWasmPaths(validPrefix, usePlatformFetch);\n    let wasmPath: string;\n    const realFetch = util.fetch;\n
spyOn(util, 'fetch').and.callFake((path: string) => {\n      wasmPath = path;\n      return realFetch(path);\n
    });\n    expect(await tf.setBackend('wasm-test')).toBe(true);\n    const validPaths = new Set([\n      validPrefix +
'tfjs-backend-wasm.wasm',\n      validPrefix + 'tfjs-backend-wasm-simd.wasm',\n      validPrefix + 'tfjs-backend-
wasm-threaded-simd.wasm',\n    ]);\n    expect(validPaths).toContain(wasmPath);\n  });\n\n  it('backend init
works when the wasm paths overrides map is valid and '+\n
'using platform fetch',\n  async () => {\n    const usePlatformFetch = true;\n    const validPrefix = '/base/wasm-out';\n
setWasmPaths({\n      'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-wasm.wasm',\n      'tfjs-backend-wasm-simd.wasm':\n
'/base/wasm-out/tfjs-backend-wasm-simd.wasm',\n      'tfjs-backend-wasm-threaded-simd.wasm':\n
'/base/wasm-out/tfjs-backend-wasm-threaded-simd.wasm'\n    },\n    usePlatformFetch);\n    let
wasmPath: string;\n    const realFetch = util.fetch;\n    spyOn(util, 'fetch').and.callFake((path: string) => {\n
wasmPath = path;\n      return realFetch(path);\n    });\n    expect(await tf.setBackend('wasm-

```

```

test')).toBe(true);\n    const validPaths = new Set([\n      validPrefix + 'tfjs-backend-wasm.wasm',\n      validPrefix + 'tfjs-backend-wasm-simd.wasm',\n      validPrefix + 'tfjs-backend-wasm-threaded-simd.wasm',\n    ]);\n    expect(validPaths).toContain(wasmPath);\n  });\n\n  it('backend init works when the path is valid and use\nplatform fetch',\n  async () => {\n    const usePlatformFetch = true;\n    const validPath = '/base/wasm-out/tfjs-\nbackend-wasm.wasm';\n    setWasmPath(validPath, usePlatformFetch);\n    let wasmPath: string;\n    const\nrealFetch = util.fetch;\n    spyOn(util, 'fetch').and.callFake((path: string) => {\n      wasmPath = path;\n    });\n    expect(await tf.setBackend('wasm-test')).toBe(true);\n    expect(wasmPath).toBe(validPath);\n  });\n\n  // Disabling this test because it intermittently times out on CI.\n  // tslint:disable-next-line: ban\n  it('backend init fails when the path is invalid and use platform fetch',\n  async ()\n=> {\n    const usePlatformFetch = true;\n    setWasmPath('invalid/path', usePlatformFetch);\n    let\nwasmPath: string;\n    const realFetch = util.fetch;\n    spyOn(util, 'fetch').and.callFake((path: string) => {\n      wasmPath = path;\n      return realFetch(path);\n    });\n    expect(await tf.setBackend('wasm-\ntest')).toBe(false);\n    expect(wasmPath).toBe('invalid/path');\n  });\n\n  it('backend init succeeds with default\npath', async () => {\n    expect(await tf.setBackend('wasm-test')).toBe(true);\n  });\n\n  it('setWasmPath called too\nlate', async () => {\n    // Set an invalid path.\n    setWasmPath('invalid/path');\n    await tf.setBackend('wasm-\ntest');\n\n    // Setting the path too late.\n    expect(() => setWasmPath('too/late'))\n      .toThrowError(/The WASM\nbackend was already initialized. Make sure/);\n  });\n}]]}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index_test.js.map
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```

{"version":3,"file":"Fill.js","sourceRoot":"","sources":["../../src/kernels/Fill.ts"],"names":[],"mappings":"AAAA;:::;\n;:::;GAeG;AAGH,OAAO,EAAC,IAAI,EAAY,MAAM,uBAAuB,CAAC;AAItD,MAAM,UAAU,IAAI,CAAC,IA\nA8C;IACjE,MAAM,EAAC,KAAK,EAAE,EAAC,KAAK,EAAE,KAAK,EAAE,KAAK,EAAC,EAAE,OAAO,EA\nAC,GAAG,IAAI,CAAC;IACrD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,KAAK,EAAE,KAAK,CAA\nC,CAAC;IAC7C,MAAM,OAAO,GAAG,OAAO,CAAC,kBAaKb,CAAC,GAAG,CAAC,CAAC;IAChD,OAAO,C\nAAC,IAAI,CAAC,KAAe,CAAC,CAAC;IAC9B,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MA\nAM,UAAU,GAAiB;IACtC,UAAU,EAAE,IAAI;IACb,WAaw,EAae,MAAM;IACnB,UAAU,EAAE,IAAwB;C\nACrC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n *import {Fill, FillAttrs} from\n '@tensorflow/tfjs-core';\n *import {BackendWasm} from './backend_wasm';\n *export function fill(args: {attrs:\n FillAttrs, backend: BackendWasm}) {\n *  const {attrs: {shape, value, dtype}, backend} = args;\n *  const out =\n backend.makeOutput(shape, dtype);\n *  const outVals = backend.typedArrayFromHeap(out);\n *  outVals.fill(value as\n number);\n *  return out;\n *}\n *export const fillConfig: KernelConfig = {\n *  kernelName: Fill,\n *  backendName:\n 'wasm',\n *  kernelFunc: fill as { } as KernelFunc,\n *};\n *]]}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Fill.js.map

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 *
 * =====
 */
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/test_node.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.js

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```
{"version":3,"file":"FusedBatchNorm.js","sourceRoot":"","sources":["../../src/kernels/FusedBatchNorm.ts"],"names":
:[],"mappings"::AAAA;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,cAAc,EAAMF,IAAI,EAAC,MAAM,uBAAuB,CA
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CAAC,IAIvB;IACC,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MA
AM,EAAC,eAAe,EAAC,GAAG,KAAK,CAAC;IAChC,MAAM,EAAC,CAAC,EAAE,IAAI,EAAE,QAAQ,EAAE,
MAAM,EAAE,KAAK,EAAC,GAAG,MAAM,CAAC;IACID,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC
,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,MAAM,MAAM,GAAG,OAAO,CAA
C,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IACrD,MAAM,UAAU,GAAG,
OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,QAAQ,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC7D,MAAM,
QAAQ,GAAG,MAAM,IAAI,IAAI,CAAC,CAAC,CAAC,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,MAAM,CA
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AK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAE
nD,aAAa,CACT,GAAG,EAAE,MAAM,EAAE,UAAU,EAAE,QAAQ,EAAE,OAAO,EAAE,eAAe,EAAE,KAAK,
CAAC,CAAC;IACxE,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,oBAAoB,GAAiB;IAC
hD,UAAU,EAAE,cAAc;IAC1B,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IACkB,UAAU,EAAE,cAA
kC;CAC/C,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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```

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```
=====\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,  
TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet  
wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,  
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number',  
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n  backend:  
BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} =  
inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =  
backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const  
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ?  
backend.dataIdMap.get(scale.dataId).id : 0;\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-  
circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n\n  const outId =  
backend.dataIdMap.get(out.dataId).id;\n\n  wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId,  
varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName:  
FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as {} as  
KernelFunc\n};\n"}\n
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedBatchNorm.js.map

No license file was found, but licenses were detected in source scan.

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aAAa,EAAC,MAAM,0CAA0C,CAAC;AACrF,iDAAiD;AACjD,OAAO,EAAC,SAAS,IAAI,YAAY,EAAC,MAA  
M,0CAA0C,CAAC;AACnF,iDAAiD;AACjD,OAAO,EAAC,SAAS,IAAI,YAAY,EAAC,MAAM,0CAA0C,CAAC;  
AAEnF,OAAO,EAAC,aAAa,EAAE,YAAY,EAAE,YAAY,EAAC,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *  
*\n */\n
```

```
=====\n*\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-  
line: no-imports-from-dist\nimport {concatImpl as concatImplCPU} from '@tensorflow/tfjs-backend-  
cpu/dist/shared';\n// tslint:disable-next-  
line: no-imports-from-dist\nimport {sliceImpl as sliceImplCPU} from  
'@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-  
line: no-imports-from-dist\nimport {rangeImpl as rangeImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n\nexport {concatImplCPU, rangeImplCPU,  
sliceImplCPU};\n"}\n
```


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```

=====
*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number,\n   biasId: number, padTop: number, padRight: number, padBottom: number,\n   padLeft: number, isSamePad: number, dilationHeight: number,\n   dilationWidth: number, strideHeight: number, strideWidth: number,\n   inputChannels: number, outputChannels: number, activation: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n    void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function fusedConv2d(args: {\n    inputs: FusedConv2DInputs,\n    backend: BackendWasm,\n    attrs: FusedConv2DAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias, preluActivationWeights} = inputs;\n    const {strides, pad, dilations, dataFormat, dimRoundingMode, activation, leakyreluAlpha} = attrs;\n\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode);\n\n    const fusedActivation =\n      FusableActivation[activation as {} as keyof typeof FusableActivation];\n    if (fusedActivation == null) {\n      throw new Error(\n        ` ${activation} activation not yet supported for FusedConv2D ` +\n        `in the wasm backend.`);\n    }\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId =\n      backend.dataIdMap.get(filter.dataId).id;\n\n    const outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if (bias != null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}`);\n      }\n      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n      }\n      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize = convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if (dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedConv2D does not support dataFormat:` +\n        ` ${dataFormat}. Please use 'NHWC'.`);\n    }\n\n    const out =\n      backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const preluActivationWeightsId = preluActivationWeights == null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n    wasmFusedConv2d(\n      xId, batchSize, inHeight,

```

```
inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,  
dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation,  
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:  
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:  
fusedConv2d as {} as KernelFunc\n};\n}}
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/dist/kernels/FusedConv2D.js.map

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```
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 * =====  
 */
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/dist/kernel_utils/shared.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/src/kernels/Pack.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/dist/kernels/Mean.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/dist/kernels/OneHot.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/dist/kernels/Identity.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/dist/kernels/Cumsum.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/src/register_all_kernels.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/src/kernels/SplitV.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/dist/kernels/OnesLike.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-
wasm/dist/kernels/ZerosLike.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
wasm/dist/kernels/Neg.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Select.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Prod.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prod.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Step.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV4.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pack.js
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Equal.d.ts
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No license file was found, but licenses were detected in source scan.

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AAE,MAAM;IACnB,SAAS,EAAE,KAAK;IACbB,UAAU,EAAE,IAAwB;CACrC,CAAC", "sourcesContent": [ "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,\n * Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may\n * obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by\n * applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import { KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs } from '@tensorflow/tfjs-core';\n *import\n *{ BackendWasm } from '../backend_wasm';\n *import { CppDType } from './types';\n *let wasmTile: (n  xId:\n *number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n *newShapeSize: number, dtype:\n *number, outId: number) => void;\n *function setup(backend: BackendWasm) {\n *  wasmTile =\n *  backend.wasm.cwrap(Tile, null /* void */, [\n *    'number', // x_id\n *    'array', // x_shape\n *    'number', //\n *    x_shape.length\n *    'array', // new_shape\n *    'number', // new_shape.length\n *    'number' // out_id\n *  ]);\n *}\n *function tile(\n *  args: { inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs }) {\n *  const { inputs,\n *  backend, attrs } = args;\n *  const { x } = inputs;\n *  const xId = backend.dataIdMap.get(x.dataId).id;\n *  const { reps } =\n *  attrs;\n *  const newShape: number[] = new Array(x.shape.length);\n *  for (let i = 0; i < newShape.length; i++) {\n *    newShape[i] = x.shape[i] * reps[i];\n *  }\n *  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n *  const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n *  const out =\n *  backend.makeOutput(newShape, x.dtype);\n *  const outId = backend.dataIdMap.get(out.dataId).id;\n *  wasmTile(\n *  xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n *  CppDType[out.dtype], outId);\n *  return\n *  out;\n *}\n *export const tileConfig: KernelConfig = {\n *  kernelName: Tile,\n *  backendName: 'wasm',\n *  setupFunc:\n *  setup,\n *  kernelFunc: tile as {} as KernelFunc\n *};\n *}] }
```


Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tile.js.map

No license file was found, but licenses were detected in source scan.

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=====\n *\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LogicalAnd.js.map

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=====\n *\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n"]}
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the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====\n*\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Ceil.js.map

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
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```

```
=====\n*\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
```

```
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array, outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number', // out_id\n  ]);\n\n  export function reverse(\n    args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} = attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend);\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n  export const reverseConfig: KernelConfig = {\n    kernelName: Reverse,\n    backendName: 'wasm',\n    kernelFunc: reverse as {} as KernelFunc,\n    setupFunc: setup\n  };"}\n\n}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reverse.js.map
```

No license file was found, but licenses were detected in source scan.

```
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```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Exp.js.map
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No license file was found, but licenses were detected in source scan.

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{"version":3,"file":"base.js","sourceRoot":"","sources":["../src/base.ts"],"names":[],"mappings":"AAAA;:::;GAeG;AAEH,OAaO,cAAc,CAAC;AAEtB,OAaO,EAAC,eAAe,EAAC,MAAM,uBAAuB,CAAC;AAEtD,OAaO,EAAC,WAAW,EAae,IAAI,EAAC,MAAM,gBAAgB,CAAC;AAEjD,OAaO,EAAC,WAAW,EAae,eAAe,EAae,eAAe,EAae,WAAW,EAae,YAAy,EAAC,MAAM,gBAAgB,CAAC;AACxG,OAaO,EAAC,OAaO,IAAI,YAAy,EAAC,MAAM,WAAW,CAAC;AAEID,MAAM,aAAa,GAAG,CAAC,CAAC;AACxB,eAAe,CAAC,MAAM,EAEE,KAaK,IAAI,EAae;IACjC,MAAM,EAAC,IAAI,EAAC,GAAG,MAAM,IAAI,EAae,CAAC;IAC5B,OAaO,IAAI,WAAW,CAAC,IAAI,CAAC,CAAC;AAC/B,CAAC,EAae,aAAa,CAAC,CAAC","sourcesContent":["/**\n * =====\n *\n */\n\nimport {Base} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const baseConfig: KernelConfig = createUnaryKernelConfig(Base, 'float32');"}\n\n}
```

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```
=====\n*\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n  const {wasm} = await init();\n  return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/base.js.map
No license file was found, but licenses were detected in source scan.

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License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Greater.js.map
No license file was found, but licenses were detected in source scan.

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{\"version\":3,\"file\":\"NonMaxSuppression_util.js\",\"sourceRoot\":\"\",\"sources\":[\"../../src/kernels/NonMaxSuppression_  
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CAAC,MAAM,EAAE,SAAS,EAAE,CAAC,CAAC,CAAC;IACxE,MAAM,gBAAgB,GAAG,MAAM,CAAC,CAA  
C,CAAC,CAAC;IACnC,MAAM,YAAY,GAAG,MAAM,CAAC,CAAC,CAAC,CAAC;IAC/B,MAAM,eAAe,GAA  
G,MAAM,CAAC,CAAC,CAAC,CAAC;IACiC,MAAM,aAAa,GAAG,MAAM,CAAC,CAAC,CAAC,CAAC;IAC  
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gB,EAAE,YAAY,EAAE,eAAe,EAAE,aAAa,EAAC,CAAC;AACIE,CAAC\", \"sourcesContent\":[\"/**\n *\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version  
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```

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```
=====\n
*\n\nimport { BackendWasm } from './backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`.\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:
number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const
pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const
pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n\n}}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppression_util.js.map

No license file was found, but licenses were detected in source scan.

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AC","sourcesContent":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```
=====\n
*\n\nimport { Abs, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n\n}}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Abs.js.map

No license file was found, but licenses were detected in source scan.

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```

outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n );\n}\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,
xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
conv2DBackpropInput as {} as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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```
*/\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize: number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n\n  function argmax(\n    args: {\n      inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs\n    }) {\n    const { backend, inputs, attrs } = args;\n    const { axis } = attrs as { } as ArgMaxAttrs;\n    const { x } = inputs as { } as ArgMaxInputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const { transposed, axes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out = backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize = util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    return out;\n  }\n\n  export const argMaxConfig: KernelConfig = {\n    kernelName: ArgMax,\n    backendName: 'wasm',\n    kernelFunc: argmax as {\n      } as KernelFunc,\n    setupFunc: setup\n  };
}
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from  
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusibleActivation } from  
 './types';\n\nlet wasmFusedMatMul:\n  (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,  
 biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,  
 null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', //  
 leakyreluAlpha\n    'number' // out_id\n  ]);\n\n  function fusedBatchMatMul(args: {\n    inputs:  
    _FusedMatMulInputs,\n    backend: BackendWasm,\n    attrs: _FusedMatMulAttrs\n  }) {\n    const { inputs, backend,  
    attrs } = args;\n    const { a, b, bias, preluActivationWeights } = inputs;\n\n    if (a.dtype !== 'float32' || b.dtype !==  
    'float32') {\n      throw new Error(\n        ` _FusedMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n    const aId =  
    backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n\n    let biasId = 0;\n    if (bias !== null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          ` _FusedMatMul only supports rank-1 bias but got ` +\n          `rank\n          ${biasData.shape.length}`);\n      }\n      biasId = biasData.id;\n    }\n\n    const preluActivationWeightsId =  
    preluActivationWeights === null ?\n      0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n    const  
    fusedActivation =\n      FusibleActivation[activation as {} as keyof typeof FusibleActivation];\n    if  
    (fusedActivation === null) {\n      throw new Error(\n        ` ${activation} activation not yet supported for  
    FusedConv2D ` +\n        ` in the wasm backend.`);\n    }\n\n    const leftDim = transposeA ? a.shape[2] : a.shape[1];\n    const rightDim = transposeB ? b.shape[1] : b.shape[2];\n    const batchDim = a.shape[0];\n\n    const out =  
    backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n    const outId =  
    backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new Uint8Array(new  
    Int32Array(a.shape).buffer);\n    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n    wasmFusedMatMul(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      transposeA,  
    transposeB, fusedActivation, biasId, preluActivationWeightsId,\n      leakyreluAlpha || 0, outId);\n\n    return  
    out;\n  }\n\n  export const fusedMatMulConfig: KernelConfig = {\n    kernelName: _FusedMatMul,\n    backendName:  
    'wasm',\n    setupFunc: setup,\n    kernelFunc: fusedBatchMatMul as {} as KernelFunc\n  };  
}
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Found in path(s):

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governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\n// Register the wasm backend.\nimport './index';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport
{ setTestEnvs } from '@tensorflow/tfjs-core/dist/jasmine_util';\nimport jasmine from
'jasmine';\n\nError.stackTraceLimit = Infinity;\n\nprocess.on('unhandledRejection', e => {\n throw
e;\n});\n\nsetTestEnvs({ name: 'wasm-node', backendName: 'wasm', isDataSync: true });\n\nconst runner = new
jasmine({});\n\nrunner.loadConfig({ spec_files: ['src/**/*.test.ts'], random: false });\n\nif
(process.env.JASMINE_SEED) {\n runner.seed(process.env.JASMINE_SEED);\n}\n\nrunner.execute();\n\n}]
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function min(args: { backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n    const { transposed, axes, originalAxes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n    if (inputWasTransposed) {\n      const transposedId =\n        backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We\n        // will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n    }\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('min', axes,\n      inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape,\n        axes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n    const out = backend.makeOutput(outShape,\n      input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId =\n        backend.dataIdMap.get(out.dataId).id;\n      wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n    }\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape,\n        originalAxes);\n      out.shape = newShape;\n    }\n    return out;\n  }\n\n  export const minConfig: KernelConfig = {\n    kernelName: Min,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: min as {} as KernelFunc\n  };
}
```

Found in path(s):
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Min.js.map
No license file was found, but licenses were detected in source scan.

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the specific language governing permissions and\n * limitations under the License.\n *
=====\n *\n\nimport { ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { reshape } from
'./Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const { inputs, attrs, backend } = args;\n const { input } = inputs;\n const { dim } =
attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let \$dim = dim;\n if
(dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [\${-(inputRank + 1)}, \${\n inputRank\n }]);\n \$dim = inputRank + dim
+ 1;\n }\n newShape.splice(\$dim, 0, 1);\n\n return reshape({ inputs: { x: input }, backend, attrs: { shape:
newShape });\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as { } as KernelFunc,\n};\n\n"]

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ExpandDims.js.map

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=====\n *\n\nimport { KernelConfig, Tanh } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
```

```
./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n"]}}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tanh.js.map
```

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```
/**
```

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```
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```

```
* =====
```

```
*/
```

```
/**
```

```
* @deprecated Use `setWasmPaths` instead.
```

```
* Sets the path to the `wasm` file which will be fetched when the wasm
```

```
* backend is initialized. See
```

```
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
```

```
* for more details.
```

```
* @param path wasm file path or url
```

```
* @param usePlatformFetch optional boolean to use platform fetch to download
```

```
* the wasm file, default to false.
```

```
*
```

```
* @doc {heading: 'Environment', namespace: 'wasm'}
```

```
*/
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/backend_wasm.ts
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.d.ts
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.js
```

No license file was found, but licenses were detected in source scan.

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the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n\n"]}

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/unary_kernel.js.map

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```
=====\n*\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number', // out id\n  ]);\n\n  function cropAndResize(args: {\n    backend: BackendWasm,\n    inputs: CropAndResizeInputs,\n    attrs: CropAndResizeAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {method, extrapolationValue, cropSize} = attrs;\n    const {image, boxes, boxInd} = inputs;\n    const numBoxes = boxes.shape[0];\n    const [cropHeight, cropWidth] = cropSize as [number, number];\n    const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n    let imagesData = backend.dataIdMap.get(image.dataId);\n    let castedData;\n    if (image.dtype !== 'float32') {\n      castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n      imagesData = backend.dataIdMap.get(castedData.dataId);\n    }\n    const imagesId = imagesData.id;\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n    const out = backend.makeOutput(outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n    wasmCropAndResize(\n      imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n      cropWidth,\n      InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n      extrapolationValue, outId);\n    if (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n    return out;\n  }\n\n  export const cropAndResizeConfig: KernelConfig = {\n    kernelName: CropAndResize,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: cropAndResize as {} as KernelFunc\n  };\n}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/CropAndResize.js.map

No license file was found, but licenses were detected in source scan.

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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV3.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { identity } from\n './Identity';\nimport { CppDType } from './types';\n\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,\n  xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n  void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // dtype\n    'number', // outId\n    'array', // perm\n    'number', // perm.length\n  ]);\n\n  export function transpose(\n    args:\n    { inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs }):\n    TensorInfo {\n    const { inputs,\n    backend, attrs } = args;\n    // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n    // better due to simpler memory access pattern.\n    const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n    attrs.perm);\n\n    let permIsNoOp = true;\n    for (let i = 0; i < perm.length; i++) {\n      if (perm[i] !== i) {\n        permIsNoOp = false;\n      }\n    }\n\n    const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n    const x = {\n      dataId: inputs.x.dataId,\n      shape: reducedShape,\n      dtype: inputs.x.dtype\n    };\n\n    if (permIsNoOp) {\n      const cloned = identity({ inputs, backend });\n      cloned.shape = outShape;\n      return cloned;\n    }\n\n    const out =\n    backend.makeOutput(outShape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n    const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmTranspose(\n      xId,\n      xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n      perm.length);\n\n    return\n    out;\n  }\n\n  function computeOutShape(inShape: number[], perm: number[]): number[] {\n    const outShape = new\n    Array(inShape.length);\n    for (let i = 0; i < outShape.length; i++) {\n      outShape[i] = inShape[perm[i]];\n    }\n\n    return outShape;\n  }\n\n  function removeOneSizeDims(\n    shape: number[], perm: number[]): [number[], number[]]\n    {\n    const newShape: number[] = [];\n    const newPerm: number[] = [];\n    for (let i = 0; i < shape.length; ++i) {\n      if\n      (shape[i] !== 1) {\n        newShape.push(shape[i]);\n      }\n      if (shape[perm[i]] !== 1) {\n        newPerm.push(perm[i]);\n      }\n    }\n\n    for (let i = 0; i < newPerm.length; ++i) {\n      let minValIdx = -1;\n      for (let j =\n      0; j < newPerm.length; ++j) {\n        if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >\n        newPerm[j])) {\n          minValIdx = j;\n        }\n      }\n      newPerm[minValIdx] = i;\n    }\n\n    return [newShape,\n    newPerm];\n  }\n\n  export const transposeConfig: KernelConfig = {\n    kernelName: Transpose,\n    backendName:\n    'wasm',\n    kernelFunc: transpose as {} as KernelFunc,\n    setupFunc: setup,\n  };\n}
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Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transpose.js.map
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n  padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n      'bool', // padToMaxOutputSize\n    ]);\n\n  function nonMaxSuppressionV4(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV4Inputs,\n    attrs: NonMaxSuppressionV4Attrs\n  }): TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize } =\n      attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId =\n      backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      padToMaxOutputSize);\n\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using scores for V4, we have to delete it from the heap.\n    backend.wasm._free(pSelectedScores);\n\n    const selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n    const validOutputsTensor =\n      backend.makeOutput([], 'int32', pValidOutputs);\n\n    return [selectedIndicesTensor, validOutputsTensor];\n  }\n\n  export const nonMaxSuppressionV4Config: KernelConfig = {\n    kernelName: NonMaxSuppressionV4,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: nonMaxSuppressionV4 as {\n      as KernelFunc,\n    };}\n}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV4.js.map
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No license file was found, but licenses were detected in source scan.

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```



```

inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n  [batchSize,\n  outputHeight, outputWidth, outputDepth] :\n  [batchSize, outputDepth, outputHeight, outputWidth];\n\n const\n  out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const\n  xId = xData.id;\n const xStridesBytes =\n  new Uint8Array(new\n  Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new\n  Int32Array(outputShape).buffer);\n const outStridesBytes =\n  new Uint8Array(new\n  Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n\n wasmDepthToSpace(\n  xId, blockSize, channelsLast,\n  xStridesBytes, x.shape.length - 1,\n  outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return\n  out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:\n  'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
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```

No license file was found, but licenses were detected in source scan.

```

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ernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_m
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cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-
cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/k
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ls/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","..
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ls.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSu
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ck.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/
Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts
","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../
src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Sof
tmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts
","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts",".
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src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../sr
c/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm-threaded-
simd.worker.js","../wasm-out/tfjs-backend-
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```

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```
=====\n*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {n float32 = 0,\nint32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4}\n\n// Must match enum in cc/fusable_activations.h.\nexport  
enum FusableActivation {n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu  
= 6}\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache  
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License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { FusableActivation } from  
'./types';\n\nlet wasmFusedMatMul:\n (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, activation: number,  
biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\nvoid;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,  
null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', //  
leakyreluAlpha\n 'number' // out_id\n ]);\n\nfunction fusedBatchMatMul(args: {\n inputs:  
_FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend,  
attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !==  
'float32') {\n throw new Error(\n ` _FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId =  
backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if  
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n ` _FusedMatMul only supports rank-1 bias but got ` +\n `rank  
${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n\n const preluActivationWeightsId =  
preluActivationWeights == null ?\n 0 :  
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n const  
fusedActivation =\n FusableActivation[activation as { } as keyof typeof FusableActivation];\n\n if  
(fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for  
FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =  
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n\n const outId =  
backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new  
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n transposeA,  
transposeB, fusedActivation, biasId, preluActivationWeightsId,\n leakyreluAlpha || 0, outId);\n\n return  
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:  
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n\n",/**\n * @license\n *  
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```


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```
=====\n*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nexport function createUnaryKernelConfig(\n  kernelName: string, outType?: DataType): KernelConfig {\n  let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n      'number', // x_id\n      'number', // dtype\n      'number', // out_id\n    ]);\n\n    function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs});\n    TensorInfo {\n      const {backend, inputs: {x}} = args;\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const out = backend.makeOutput(x.shape, outType || x.dtype);\n      const outId = backend.dataIdMap.get(out.dataId).id;\n\n      // Short-circuit zero-sized tensors.\n      if (util.sizeFromShape(out.shape) === 0) {\n        return out;\n      }\n\n      wasmFunc(xId, CppDType[x.dtype], outId);\n      return out;\n    }\n\n    return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n  }\n\n  /*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nexport function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?: DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'number', // b_id\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number', // out_id\n    ]);\n\n    function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs});\n    TensorInfo {\n      const {backend, inputs} = args;\n      const {a, b} = inputs;\n      const aId = backend.dataIdMap.get(a.dataId).id;\n      const bId = backend.dataIdMap.get(b.dataId).id;\n\n      const outputType = dtype != null ? dtype : a.dtype;\n      const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n      const out = backend.makeOutput(newShape, outputType);\n\n      // Short-circuit zero-sized tensors.\n      if (util.sizeFromShape(newShape) === 0) {\n        return out;\n      }\n\n      const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n      const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n      const outId = backend.dataIdMap.get(out.dataId).id;\n\n
```

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const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n  if\n  (supportsFullBroadcast && a.dtype === 'float32') {\n    kernelFunc();\n    return out;\n  }\n\n const\n  aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n  const bBroadcastDims =\n  backend_util.getBroadcastDims(b.shape, newShape);\n  const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n  v === i);\n  const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n  if (loopsOverAllOfA &&\n  loopsOverAllOfB) {\n    kernelFunc();\n    return out;\n  } else {\n    throw new Error(\n      `Broadcasting\n      along outer dims is not yet ` +\n      `supported for ${a.dtype} ${kernelName}.`);\n  }\n}\n\n return\n  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n * Copyright 2019 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n  http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n  './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n  http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n  {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc:\n  (inputIds:\n  Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n  void;\n\nfunction setupFunc(backend:\n  BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n  'array', // input_ids\n  'number', // input_ids.length\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction addn(args: {inputs:\n  TensorInfo[], backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const out =\n  backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n  if\n  (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  const inputIds = inputs.map(x =>\n  backend.dataIdMap.get(x.dataId).id);\n  const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmFunc(inputIdsBytes, inputIds.length,\n  CppDType[out.dtype], outId);\n  return out;\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName:\n  AddN,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: addn as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n * \n * \n  http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n  agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * \n  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n  {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function\n  identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs, backend} =

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args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.tensorArrayFromHeap(x);\n const outVals = backend.tensorArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *\n *=====\n\n*/\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { identity } from\n './Identity';\nimport { CppDType } from './types';\n\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,\n  xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n  void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // dtype\n    'number', // outId\n    'array', // perm\n    'number', // perm.length\n  ]);\n\n  export function transpose(\n    args:\n    { inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs }):\n    TensorInfo {\n    const { inputs,\n    backend, attrs } = args;\n    // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n    // better\n    due to simpler memory access pattern.\n    const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n    attrs.perm);\n\n    let permIsNoOp = true;\n    for (let i = 0; i < perm.length; i++) {\n      if (perm[i] !== i) {\n        permIsNoOp = false;\n      }\n    }\n    const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n    const x = {\n    dataId: inputs.x.dataId,\n    shape: reducedShape,\n    dtype: inputs.x.dtype\n    };\n\n    if (permIsNoOp) {\n      const\n      cloned = identity({ inputs, backend });\n      cloned.shape = outShape;\n      return cloned;\n    }\n\n    const out =\n    backend.makeOutput(outShape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n    const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmTranspose(\n      xId,\n      xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n      perm.length);\n    return\n    out;\n  }\n\n  function computeOutShape(inShape: number[], perm: number[]): number[] {\n    const outShape = new\n    Array(inShape.length);\n    for (let i = 0; i < outShape.length; i++) {\n      outShape[i] = inShape[perm[i]];\n    }\n    return outShape;\n  }\n\n  function removeOneSizeDims(\n    shape: number[], perm: number[]): [number[], number[]]\n    {\n    const newShape: number[] = [];\n    const newPerm: number[] = [];\n    for (let i = 0; i < shape.length; ++i) {\n      if\n      (shape[i] !== 1) {\n        newShape.push(shape[i]);\n      }\n      if (shape[perm[i]] !== 1) {\n        newPerm.push(perm[i]);\n      }\n    }\n    for (let i = 0; i < newPerm.length; ++i) {\n      let minValIdx = -1;\n      for (let j =\n      0; j < newPerm.length; ++j) {\n        if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >\n        newPerm[j])) {\n          minValIdx = j;\n        }\n      }\n      newPerm[minValIdx] = i;\n    }\n    return [newShape,\n    newPerm];\n  }\n\n  export const transposeConfig: KernelConfig = {\n    kernelName: Transpose,\n    backendName:\n    'wasm',\n    kernelFunc: transpose as {} as KernelFunc,\n    setupFunc: setup,\n  };\n\n  "/**\n  *\n  * @license\n  *\n  * Copyright\n  * 2020 Google Inc. All Rights Reserved.\n  *\n  * Licensed\n  * under the\n  * Apache\n  * License,\n  * Version\n  * 2.0 (the\n  * "License").\n  *\n  * you may\n  * not use\n  * this file\n  * except in\n  * compliance\n  * with the\n  * License.\n  *\n  * You may\n  * obtain a\n  * copy of the\n  * License at\n  *\n  * http://www.\n  * apache.org/\n  * licenses/\n  * LICENSE-2.0\n  *\n  *\n  * Unless\n  * required\n  * by\n  * applicable\n  * law or\n  * agreed to\n  * in\n  * writing,\n  * software\n  * distributed\n  * under the\n  * License is\n  * distributed\n  * on an\n  * "AS IS"\n  * BASIS,\n  * WITHOUT\n  * WARRANTIES\n  * OR\n  * CONDITIONS\n  * OF ANY\n  * KIND,\n  * either\n  * express\n  * or\n  * implied.\n  *\n  * See the\n  * License\n  * for the\n  * specific\n  * language\n  * governing\n  * permissions\n  * and\n  * limitations\n  * under the\n  * License.\n  *\n  *=====\n\n*/\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from\n '../backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose

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if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank = x.shape.length;\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n    axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nlet wasmAll: (xId: number, reduceSize: number, outId:\n number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null\n /*void*/, [number, number, number]);\n}\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:\n AllAttrs}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}\n = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n  const\n {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n  if\n (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =\n transposed;\n    inputId = transposedId;\n  }\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =\n util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape, x.dtype);\n  if\n (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAll(inputId, reduceSize, outId);\n  }\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n    // reshape\n    const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n  return\n out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:\n setup,\n  kernelFunc: all as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:

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number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis,
backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*/\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {permuteAxesAndTranspose} from
 './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n}\n\nfunction argmax(\n  args:
{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n  const {backend, inputs, attrs} = args;\n
  const {axis} = attrs as {} as ArgMaxAttrs;\n  const {x} = inputs as {} as ArgMaxInputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes,
inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n
  const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId !== xId) {\n    // transpose
was not a no-op. We will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId =
transposedId;\n  }\n}\n\n  const outShape = input.shape.slice(0, -1);\n  const out =
backend.makeOutput(outShape, 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const outerSize =
util.sizeFromShape(out.shape);\n  const innerSize = input.shape[axes[0]];\n  wasmFunc(inputId,
CppType[input.dtype], outerSize, innerSize, outId);\n\n  if (inputWasTransposed) {\n    // dispose of the
transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as {}
as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n

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*/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n
'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n
'number', // padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
strideHeight\n  'number', // strideWidth\n  'number', // channels\n  'number', // outId\n ]);\n}\n\nfunction
avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs,
backend} = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n
`wasm backend does not support dataFormat:` +\n      `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n
`was backend
only supports average pooling with dilation = [1, 1],` +\n      `got [{convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const
outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as {} as KernelFunc\n};\n\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n  args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} =
inputs;\n  const {shape} = attrs;\n\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n      `shape must have the same number of
elements.`);\n\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n
return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n
kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as {} as KernelFunc\n};\n\n"/**\n * @license\n
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```

```

=====
*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend:
BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const
bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA =
util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const
batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input
batch dimensions must either be the ` +\n        `same or at least one input batch dimension must be 1. Got input `
+\n        `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n        `${innerShapeB}) of Tensors with shapes
${a.shape} and ` +\n        `${b.shape} and transposeA=${transposeA}` +\n        ` and transposeB=${transposeB}
must match.`);\n\n    const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n    const b3dShape = transposeB ? [batchDimB, outerShapeB,\n      innerShapeB] :\n      [batchDimB, innerShapeB, outerShapeB];\n\n    // The rest of the
implementation is designed to operate on rank-3 tensors\n    const a3d = reshape({inputs: {x: a}, backend, attrs:
{shape: a3dShape}});\n    const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n    const a3dId
= backend.dataIdMap.get(a3d.dataId).id;\n    const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n    const leftDim
= transposeA ? a3d.shape[2] : a3d.shape[1];\n    const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n    const
batchDim = Math.max(batchDimA, batchDimB);\n\n    const out = backend.makeOutput([batchDim, leftDim,\n      rightDim], a3d.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new
Uint8Array(new Int32Array(a3d.shape).buffer);\n    const bShapeBytes = new Uint8Array(new
Int32Array(b3d.shape).buffer);\n\n    wasmBatchMatMul(\n      a3dId, aShapeBytes, a3d.shape.length, b3dId,\n      bShapeBytes,\n      b3d.shape.length, transposeA, transposeB, outId);\n\n    backend.disposeData(a3d.dataId);\n    backend.disposeData(b3d.dataId);\n\n    out.shape = outShape;\n    return out;\n  }\n\n  export const batchMatMulConfig:
KernelConfig = {\n    kernelName: BatchMatMul,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:
batchMatMul as KernelFunc\n  };}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, util } from '@tensorflow/tfjs-core';\n\nexport function concatImpl(inputs, outShape, dtype,

```


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```
=====
import {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}
from '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import {sliceImplCPU} from
'./kernel_utils/shared';
export function slice(
  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:
BackendWasm}) {
  const {inputs: {x}, attrs: {begin, size}, backend} = args;
  const [begin_, size_] =
slice_util.parseSliceParams(x, begin, size);
  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);
  const xVals = backend.readSync(x.dataId);
  const out = backend.makeOutput(size_, x.dtype);
  const
xStrides = util.computeStrides(x.shape);
  const outData = backend.dataIdMap.get(out.dataId);
  if (isContinuous)
  {
    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);
    if (x.dtype === 'string') {
      outData.stringBytes =
(xVals as Uint8Array[]).slice(flatOffset, flatOffset +
util.sizeFromShape(size_));
    } else {
      const outVals = backend.typedArrayFromHeap(out);
      outVals.set(
(xVals as TypedArray).subarray(flatOffset, flatOffset +
util.sizeFromShape(size_)));
    }
  }
  return out;
}
if (x.dtype === 'string') {
  const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);
  outData.stringBytes = res as Uint8Array[];
  return
out;
}
const outVals = backend.typedArrayFromHeap(out);
const rank = x.shape.length;
if (rank === 2)
{
  slice2d(
xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],
size_ as
[number, number]);
} else if (rank === 3) {
  slice3d(
xVals as TypedArray, xStrides[0], xStrides[1],
outVals,
begin_ as [number, number, number], size_ as [number, number, number]);
} else if (rank === 4)
{
  slice4d(
xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,
begin_ as [number,
number, number, number],
size_ as [number, number, number, number]);
} else {
  const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;
  outVals.set(res);
}
return
out;
}
function slice2d(
xVals: backend_util.TypedArray, xStride: number,
outVals:
backend_util.TypedArray, begin: [number, number],
size: [number, number]): void {
  let outOffset = 0;
  const beginI = begin[0];
  const beginJ = begin[1];
  const endI = beginI + size[0];
  for (let i = beginI; i < endI;
i++) {
    const xOffset = i * xStride + beginJ;
    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);
    outOffset += size[1];
  }
}
function slice3d(
xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,
outVals: backend_util.TypedArray, begin: [number, number, number],
size:
[number, number, number]): void {
  let outOffset = 0;
  const beginI = begin[0];
  const beginJ = begin[1];
  const beginK = begin[2];
  const endI = beginI + size[0];
  const endJ = beginJ + size[1];
  for (let i = beginI; i <
endI; i++) {
    for (let j = beginJ; j < endJ; j++) {
      const xOffset = i * xStride1 + j * xStride2 + beginK;
      outVals.set(xVals.subarray(xOffset, xOffset + size[2]),
outOffset);
      outOffset += size[2];
    }
  }
}
function slice4d(
xVals: backend_util.TypedArray, xStride1: number, xStride2: number,
xStride3:
number, outVals: backend_util.TypedArray,
begin: [number, number, number, number],
size: [number,
number, number, number]): void {
  let outOffset = 0;
  const beginI = begin[0];
  const beginJ = begin[1];
  const beginK = begin[2];
  const endI = beginI + size[0];
  const endJ = beginJ + size[1];
  const endK = beginK
+ size[2];
  const beginL = begin[3];
  for (let i = beginI; i < endI; i++) {
    for (let j = beginJ; j < endJ; j++)
    {
      for (let k = beginK; k < endK; k++) {
        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;
        outVals.set(xVals.subarray(xOffset, xOffset + size[3]),
outOffset);
        outOffset += size[3];
      }
    }
  }
}
export const sliceConfig: KernelConfig = {
  kernelName: Slice,
  backendName: 'wasm',
  kernelFunc: slice as { } as KernelFunc,
};
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```
=====\n*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs: BatchToSpaceNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockShape, crops } = attrs;\n\n  const prod = blockShape.reduce((a, b) => a * b);\n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n  const xReshaped = reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n  const xTransposed = transpose({ inputs: { x: xReshaped }, backend, attrs: { perm: permuted } });\n  const xTransposedReshaped = reshape({ inputs: { x: xTransposed }, backend, attrs: { shape: reshapedPermuted } });\n  const result = slice({\n    inputs: { x: xTransposedReshaped },\n    backend,\n    attrs: { begin: sliceBeginCoords, size: sliceSize }\n  });\n\n  backend.disposeData(xReshaped.dataId);\n  backend.disposeData(xTransposed.dataId);\n  backend.disposeData(xReshaped.dataId);\n\n  return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nexport function cast(\n  args: {\n    inputs: CastInputs,\n    attrs: CastAttrs,\n    backend: BackendWasm\n  }): TensorInfo {\n  const { inputs, attrs, backend } = args;\n  const out = backend.makeOutput(x.shape, dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n\n  return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport { KernelConfig, Ceil } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
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```
=====\n*\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n    backend.wasm.cwrap(ClipByValue, null /* void */, [\n      'number', // x_id\n      'number', // min\n      'number', //\n      max\n      'number' // out_id\n    ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend:\n      BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n      backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,\n      clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as\n      KernelFunc\n  }; \n  \"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n * \n\n\n=====\n\n
```

```
*\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { concatImplCPU } from\n '../kernel_utils/shared';\n\nimport { identity } from './Identity';\n\nimport { reshape } from './Reshape';\n\nexport function\n concat(\n  args: {\n    inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs\n  }) {\n    const {inputs, backend}\n    = args;\n\n    const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n    let outShape =\n      backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n    // Keep only non-empty tensors (ignore tensors\n with 0 in their shape).\n    const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n\n    if ($inputs.length ===\n      1) {\n      return identity({inputs: {x: $inputs[0]}, backend});\n    }\n\n    const out = backend.makeOutput(outShape,\n      inputs[0].dtype);\n\n    if (util.sizeFromShape(outShape) === 0) {\n      return out;\n    }\n\n    const shapes =\n      $inputs.map(t => t.shape);\n\n    backend_util.assertParamsConsistent(shapes, axis);\n\n    if ($inputs[0].dtype ===\n      'string') {\n      // Any concat of n-dimensional tensors across any axis can be reduced to\n      // a concatenation of two-\n      dimensional tensors across the axis 1 by first\n      // partitioning the axes of the original tensors into those less than\n      the\n      // axis to be concatenated and the rest. Then reshape the tensors\n      // into a two-dimensional tensor by\n      collapsing these two sets of axes and\n      // concatenate the resulting matrices across the axis 1, finally reshaping\n      // the result to have the proper shape.\n      const inputs2D = $inputs.map(t => {\n        const innerSize =\n          util.sizeFromShape(t.shape.slice(axis));\n        const shape = [-1, innerSize];\n        return reshape({inputs: {x: t},\n          backend, attrs: {shape}});\n      });\n\n      const inputsValShapes = inputs2D.map(t => {\n        return {vals:\n          backend.readSync(t.dataId, shape: t.shape)};\n      });\n\n      // Concat 2d tensors along axis=1.\n      outShape =\n        backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n\n      const simplyConcat =\n        inputs2D[0].shape[0] === 1;\n\n      const outVals = concatImplCPU(\n        inputsValShapes, outShape,\n        inputs[0].dtype,\n        simplyConcat) as string[];\n\n      const finalOutShape =\n        backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n      out.shape = finalOutShape;\n\n      const\n      outData = backend.dataIdMap.get(out.dataId);\n      outData.stringBytes =\n        backend_util.fromStringArrayToUint8(outVals);\n\n      inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n      return out;\n    }\n\n    const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n\n    let sumInnerDims =\n      0;\n\n    const innerDims = $inputs.map(input => {\n      const innerDim = util.sizeFromShape(input.shape.slice(axis));\n\n
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    sumInnerDims += innerDim;\n    return innerDim;\n  });\n  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n  const outVals = backend.typedArrayFromHeap(out);\n  for (let b = 0; b <
batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const
innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n      outVals.set(vals, outOffset);\n      outOffset += innerDim;\n    }\n  }\n  return
out;\n}\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as { } as KernelFunc,\n};\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*/\n\nimport { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmConv2d: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,
inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n
'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n
'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n
'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n
'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n
'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction conv2d(\n  args: { inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs }) {\n  const { inputs, attrs, backend } = args;\n  const { x, filter } = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n
const { strides, dilations, pad, dimRoundingMode, dataFormat } = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n  pad, dimRoundingMode, false,
$dataFormat);\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const
padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom =
convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend
Conv2D does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n  }\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n    filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc,\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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=====\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number, filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n  outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n  xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride: number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n    'number', // dyId\n    'number', // filterId\n    'number', // batchSize\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // inHeight\n    'number', // inWidth\n    'number', // inChannels\n    'number', // outHeight\n    'number', // outWidth\n    'number', // outChannels\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // topPad\n    'number', // leftPad\n    'number', // fltS0\n    'number', // fltS1\n    'number', // fltS2\n    'number', // xBatchStride\n    'number', // xRowStride\n    'number', // xColStride\n    'number', // xChannelStride\n    'number', // yBatchStride\n    'number', // yRowStride\n    'number', // yColStride\n    'number', // yChannelStride\n    'number', // outId\n  ]);\n\n  function conv2DBackpropInput(args: {\n    backend: BackendWasm,\n    inputs: Conv2DBackpropInputInputs,\n    attrs: Conv2DBackpropInputAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { dy, filter } = inputs;\n    const { strides, pad, dataFormat, dimRoundingMode, inputShape } = attrs;\n\n    const dilations = 1;\n    const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      inputShape, filter.shape as [number, number, number, number], strides,\n      dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n    const {\n      batchSize, filterHeight, filterWidth, inChannels, inHeight,\n      inWidth, outChannels, outHeight, outWidth, strideHeight, strideWidth\n    } = convInfo;\n\n    const topPad = filterHeight - 1 - convInfo.padInfo.top;\n    const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n    const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n    const dxStrides = util.computeStrides(convInfo.inShape);\n    const dyStrides = util.computeStrides(dy.shape);\n    const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n    const xBatchStride = dxStrides[0];\n    const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n    const xColStride = isChannelsLast ? dxStrides[2] : 1;\n    const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n    const yBatchStride = dyStrides[0];\n    const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n    const yColStride = isChannelsLast ? dyStrides[2] : 1;\n    const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n    const out = backend.makeOutput(convInfo.inShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const dyId = backend.dataIdMap.get(dy.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    wasmConv2DBackpropInput(\n      dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n      inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n      topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n      xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n      yChannelStride, outId);\n\n    return out;\n  }\n\n  export const conv2DBackpropInputConfig: KernelConfig = {\n    kernelName: Conv2DBackpropInput,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2DBackpropInput as { } as KernelFunc\n  };*\n\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language
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=====\n\n*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number', // out id\n  ]);\n\n  function cropAndResize(args: {\n    backend: BackendWasm,\n    inputs: CropAndResizeInputs,\n    attrs: CropAndResizeAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { method, extrapolationValue, cropSize } = attrs;\n    const { image, boxes, boxInd } = inputs;\n    const numBoxes = boxes.shape[0];\n    const [cropHeight, cropWidth] = cropSize as [number, number];\n    const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n    let imagesData = backend.dataIdMap.get(image.dataId);\n    let castedData;\n    if (image.dtype !== 'float32') {\n      castedData = cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n      imagesData = backend.dataIdMap.get(castedData.dataId);\n    }\n    const imagesId = imagesData.id;\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n    const out = backend.makeOutput(outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n    wasmCropAndResize(\n      imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n      cropWidth,\n      InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n      extrapolationValue, outId);\n\n    if (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n\n    return out;\n  }\n\n  export const cropAndResizeConfig: KernelConfig = {\n    kernelName: CropAndResize,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: cropAndResize as {} as KernelFunc\n  }; \n} \n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n    finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n    wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n        'number', // x_id\n        'number', // exclusive\n        'number', // reverse\n        'number', // final_dim\n        'number', // out_id\n        'number' // dtype\n    ]);\n}\n\nexport function cumsum(\n    args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}): TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {axis, exclusive, reverse} = attrs;\n    const xRank = x.shape.length;\n    util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n        () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n    // permute required axis to inner most axis\n    const permutation = backend_util.getAxesPermutation([axis], xRank);\n    let permutedX = x;\n    if (permutation !== null) {\n        permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n    }\n    const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n    backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n    const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n    const finalDim = permutedX.shape[permutedAxis];\n    const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n    const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n    wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n        permutedOutId, CppDType[x.dtype]);\n    // transpose data back if permuted\n    let out = permutedOut;\n    if (permutation !== null) {\n        const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n        out = transpose(\n            {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n    }\n    backend.disposeData(permutedX.dataId);\n    backend.disposeData(permutedOut.dataId);\n}\n\nreturn out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n    kernelName: Cumsum,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: cumsum as {\n        KernelFunc\n    },\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
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=====\n*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n    xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n    xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n    outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n    wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /* void */, [\n        'number', // xId\n        'number', // blockSize\n        'number', // channelsLast\n        'array', // xStrides\n        'number', // xStridesLength\n        'array', // outputShape\n        'array', // outputStrides\n        'number', // outSize\n        'number', // outId\n    ]);\n}\n\nexport function depthToSpace(args: {\n    backend: BackendWasm,\n    inputs: DepthToSpaceInputs,\n    attrs: DepthToSpaceAttrs\n}): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {x} = inputs;\n    const {blockSize, dataFormat} = attrs;\n    const batchSize = x.shape[0];\n    const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n    const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n    const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n    const outputHeight = inputHeight * blockSize;\n    const outputWidth = inputWidth * blockSize;\n    const outputDepth =\n
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inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n  [batchSize,
outputHeight, outputWidth, outputDepth] :\n  [batchSize, outputDepth, outputHeight, outputWidth];\n\n const
out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const
xId = xData.id;\n const xStridesBytes =\n  new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n const outStridesBytes =\n  new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n\n wasmDepthToSpace(\n  xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n  outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n", "/*\n * @license\n *
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'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:
number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,
outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n  backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n    'number', //
xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', //
filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\nfunction
depthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs:
DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n
const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n  const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n\n
const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop =
convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if
(convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n      `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n    filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight, dilationWidth, strideHeight, strideWidth,

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inputChannels,\n  outputChannels, outId);\n  return out;\n}\n\nexport const depthwiseConv2dNativeConfig:\n  KernelConfig = {\n    kernelName: DepthwiseConv2dNative,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * \n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n  createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * \n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n * \n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * \n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from\n './Reshape';\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} =\n  attrs;\n\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if\n  (dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n        inputRank\n      }]);\n    $dim = inputRank + dim\n    + 1;\n  }\n  newShape.splice($dim, 0, 1);\n  return reshape({inputs: {x: input}, backend, attrs: {shape:\n  newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright
```

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```
=====\n*\n\nimport { KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { Fill, FillAttrs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nexport function fill(args: { attrs: FillAttrs, backend: BackendWasm }) {\n  const { attrs: { shape, value, dtype }, backend } = args;\n  const out = backend.makeOutput(shape, dtype);\n  const outVals = backendtypedArrayFromHeap(out);\n  outVals.fill(value as number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'wasm',\n  kernelFunc: fill as { } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: { inputs: FlipLeftRightInputs, backend: BackendWasm }): TensorInfo {\n  const { inputs, backend } = args;\n  const { image } = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch, imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as { } as KernelFunc,\n  setupFunc: setup\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Floor, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from '../unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

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=====
*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet
wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n  FusedBatchNorm, null /* void */,\n  ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n  backend:
BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const
{backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} =
inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =
backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-
circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName:
FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d: (\n  xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number,
padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number,
dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels:
number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n  'number', // xId\n  'number', //
batchSize\n  'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterId\n  'number', //
filterHeight\n  'number', // filterWidth\n  'number', // biasId\n  'number', // padTop\n  'number', // padRight\n
'number', // padBottom\n  'number', // padLeft\n  'number', // isSamePad\n  'number', // dilationHeight\n
'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number', //
=====

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inputChannels\n  'number', // outputChannels\n  'number', // activation\n  'number', //
preluActivationWeightsId\n  'number', // leakyreluAlpha\n  'number', // outId\n ]);\n}\n\nfunction
fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n})
{\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {\n
strides,\n  pad,\n  dilations,\n  dataFormat,\n  dimRoundingMode,\n  activation,\n  leakyreluAlpha\n } =
attrs;\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode);\n  const fusedActivation =\n
FusableActivation[activation as {} as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw
new Error(\n      `${activation} activation not yet supported for FusedConv2D` +\n      `in the wasm backend.`);\n
}\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId =
backend.dataIdMap.get(filter.dataId).id;\n  const outputChannels = convInfo.outChannels;\n  let biasId = 0;\n  if
(bias != null) {\n    const biasData = backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n
throw new Error(\n      `FusedConv2D only supports rank-1 bias but got` +\n      `rank
${biasData.shape.length}`);\n    }\n    if (biasData.shape[0] !== outputChannels) {\n    throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not` +\n      `match the number of output channels
(${outputChannels})`);\n    }\n    biasId = biasData.id;\n  }\n  const filterHeight = convInfo.filterHeight;\n  const
filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n      `wasm backend FusedConv2D does not support
dataFormat:` +\n      `${dataFormat}`. Please use 'NHWC'.`);\n  }\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n    0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n  wasmFusedConv2d(\n    xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n  return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n  kernelName: FusedConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n

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number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'number', // indicesId\n  'number', // numSlices\n  'number', // sliceRank\n  'number', //
sliceSize\n  'array', // strides\n  'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} =
inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params,
indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return
out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmGatherNd(\n  xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n  stridesBytes,
outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\nimport {reshape} from './Reshape';\nimport {CppType} from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array',
// xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,
indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n    const index
= indicesVals[i];\n    util.assert(\n      index <= axisDim - 1 && index >= 0,\n      () =>\n        `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const
indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    attrs:
{\n      shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize],\n      backend\n    });\n  const flattenOutputShape =
[\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n  ];\n\n  const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n  }\n\n  const stridesSize = flattenX.shape.length - 1;\n\n  const xData =
backend.dataIdMap.get(flattenX.dataId);\n  const xId = xData.id;\n\n  const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n  const indicesId = indicesData.id;\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const xStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n  const outStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n  wasmGather(\n    xId, CppDType[x.dtype],

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xStridesBytes, stridesSize, indicesId,\n  shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n
=====\n
*\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n
=====\n
*\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig }
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n
=====\n
*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
 '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from
 './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,
  null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // leakyrelu_alpha\n    'number', //
out_id\n  ]);\n}\n\nexport function leakyRelu(\n  args: {\n    inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
  backend: BackendWasm\n}): TensorInfo {\n  const { inputs: {x}, attrs: {alpha}, backend } = args;\n\n  const xId =
  backend.dataIdMap.get(x.dataId).id;\n  // According to TF API, LeakyRelu returns float32 when input is either
  float32\n  // or int32.\n  const out = backend.makeOutput(x.shape, 'float32');\n\n  if (util.sizeFromShape(x.shape)
  !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmFunc(xId, CppDType[x.dtype], alpha,
  outId);\n  }\n\n  return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n
backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as { } as KernelFunc,\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an\n "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an\n "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const logConfig: KernelConfig =\n createUnaryKernelConfig(Log);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an\n "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an\n "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n ]);\n\nfunction max(args: {backend:\n BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
```

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const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =
transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the
transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: max as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', //
inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', //
padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //
inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnnpack which only\n  // supports float32.\n  //\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  //\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype
=== 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const

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{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed
tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {}
as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the

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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number', // x_id\n    'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function min(args: {backend:\n BackendWasm, inputs: MinInputs, attrs: MinAttrs}): \n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let\n    inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId =\n        backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We\n        will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n\n      const inputRank = input.shape.length;\n\n      backend_util.assertAxesAreInnerMostDims('min', axes,\n        inputRank);\n      const [outShape, reduceShape] =\n        backend_util.computeOutAndReduceShapes(input.shape,\n        axes);\n      const reduceSize = util.sizeFromShape(reduceShape);\n      const out = backend.makeOutput(outShape,\n        input.dtype);\n      if (util.sizeFromShape(input.shape) !== 0) {\n        const outId =\n          backend.dataIdMap.get(out.dataId).id;\n        wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n      }\n\n      if (inputWasTransposed) {\n        // dispose of the transposed tensor.\n        backend.disposeData(transposed.dataId);\n      }\n\n      if (keepDims) {\n        // reshape\n        const newShape = backend_util.expandShapeToKeepDim(out.shape,\n          originalAxes);\n        out.shape = newShape;\n      }\n\n      return out;\n    }\n\n    export const minConfig: KernelConfig = {\n      kernelName: Min,\n      backendName: 'wasm',\n      setupFunc: setup,\n      kernelFunc: min as {} as\n      KernelFunc\n    };\n  }\n\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the\n   * Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the\n   * License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   *\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n   * implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
```

```
=====\n*\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const minimumConfig: KernelConfig =\n  createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2021 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\n// Must match\n enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
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xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // x.dtype\n  'array', // pre-
paddings\n  'array', // post-paddings\n  'number', // mode\n  'number', // outId\n  ]);\n\nfunction
mirrorPad(args: {\n  inputs: MirrorPadInputs,\n  backend: BackendWasm,\n  attrs: MirrorPadAttrs\n}) {\n  const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n  const outShape = paddings.map(\n    (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(outShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const
postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n  postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n  return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as {} as KernelFunc,\n  setupFunc:
setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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=====\n
*/\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */

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=====\n
*/\n\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

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=====\n
*/\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n
pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`\n *\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:
number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const

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pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const\n pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores,\n pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

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=====\n\n*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from\n './backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)\n => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n ]);\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,\n maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const\n resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const\n {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor\n =\n backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n\n return\n selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:\n NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as\n KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
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=====\n\n*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,\n NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from\n './backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =\n backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //\n scoreThreshold\n 'bool', // padToMaxOutputSize\n ]);\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,\n padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
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backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n
'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n ]);\n\n\nfunction kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[\n
{\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
= attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return
[selectedIndicesTensor, selectedScoresTensor];\n\n\n\nexport const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const notEqualConfig: KernelConfig =\n
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you

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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-  
core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmOneHot: (\n  indicesId: number, depth:  
number, onValue: number, offValue: number,\n  outId: number) => void;\n\nfunction setup(backend:  
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n    'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n}\n\nfunction  
oneHot(\n  args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {\n  const { inputs,  
backend, attrs } = args;\n  const { indices } = inputs;\n  const { depth, onValue, offValue } = attrs;\n  const out =  
backend.makeOutput([...indices.shape, depth], 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n  wasmOneHot(indicesId, depth, onValue, offValue, outId);\n  return out;\n}\n\nexport const oneHotConfig:  
KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: oneHot as  
{ } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed  
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n *
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=====\n*\n\nimport { KernelConfig, KernelFunc, OnesLike, OnesLikeInputs } from '@tensorflow/tfjs-core';\nimport  
{ BackendWasm } from '../backend_wasm';\n\nfunction onesLike(args: { inputs: OnesLikeInputs, backend:  
BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const  
onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as  
{ } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed  
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the  
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n *
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=====\n*\n\nimport { KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util } from '@tensorflow/tfjs-  
core';\nimport { BackendWasm } from '../backend_wasm';\nimport { concat } from './Concat';\nimport  
{ expandDims } from './ExpandDims';\n\nexport function pack(\n  args: { inputs: PackInputs, backend:  
BackendWasm, attrs: PackAttrs }):\n  TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { axis } =  
attrs;\n  if (inputs.length === 1) {\n    return expandDims(\n      { inputs: { input: inputs[0] }, backend, attrs: { dim:  
axis }});\n  }\n  const shape = inputs[0].shape;\n  const dtype = inputs[0].dtype;\n  inputs.forEach(t => {\n    util.assertShapesMatch(\n      shape, t.shape,\n      'All tensors passed to stack must have matching shapes');\n    util.assert(\n      dtype === t.dtype,\n      () => 'All tensors passed to stack must have matching dtypes');\n  });\n  const intermediateTensorInfos: TensorInfo[] = [];\n  const expandedTensors = inputs.map(t => {\n    const  
expandedT =\n      expandDims({ inputs: { input: t }, backend, attrs: { dim: axis });\n  });\n}
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intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n});\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n
'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n
]);\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-
circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n
return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const
outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as
KernelFunc,\n setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n  'number', // x_id\n  'number', // weights_id\n  'number' //
out_id\n  ]);\n\n  function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n    const {inputs, backend}
= args;\n    const {x, alpha} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if
(input.dtype !== 'float32') {\n      castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n      inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype
!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n    return out;\n  }\n\n  export const preluConfig:
KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {} as
KernelFunc\n  };}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n  'number',\n  'number',\n
'number',\n  'number'\n  ]);\n\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs:
ProdAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x}
= inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const
{transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    let
reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n
reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length, input.shape.length);\n        }\n      }\n\n
backend_util.assertAxesAreInnerMostDims(\n        'prod', reductionAxes, input.shape.length);\n      const [outShape,
reduceShape] =\n        backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n      const reduceSize
= util.sizeFromShape(reduceShape);\n\n      const out = backend.makeOutput(outShape, input.dtype);\n      if
(util.sizeFromShape(input.shape) !== 0) {\n        const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppType[out.dtype], outId);\n      }\n\n      if (inputWasTransposed) {\n        // dispose of
the transposed tensor.\n        backend.disposeData(transposed.dataId);\n      }\n\n      if (keepDims) {\n        // reshape\n
const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n        out.shape = newShape;\n      }\n\n
return out;\n    }\n\n    export const prodConfig: KernelConfig = {\n      kernelName: Prod,\n      backendName: 'wasm',\n
      setupFunc: setup,\n      kernelFunc: prod as {} as KernelFunc\n    };}\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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=====
*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n  (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n    const {backend, attrs} =
args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backend.typedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from
'/Cast';\n\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n

```



```

=====
*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n
fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n  'number', // xId\n  'number', //
batch\n  'number', // imageHeight\n  'number', // imageWidth\n  'number', // numChannels\n  'number', //
radians\n  'number', // centerX\n  'number', // centerY\n  'array', // fillBytes\n  'number', // fillLength\n
'number', // outId\n  ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =
backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n\n  const fillValues =
typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n
[...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n  imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n  centerY,
fillBytes, fillValues.length, outId);\n  return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n  backendName: 'wasm',\n  kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
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the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}

```



```

from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from
 './types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
 number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
 null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //
 sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n
    'number' // outId\n  ]);\n\n  function scatterNd(\n    args:\n      {backend: BackendWasm, inputs:
 ScatterNdInputs, attrs: ScatterNdAttrs});\n    TensorInfo {\n      const {backend, inputs, attrs} = args;\n      const {indices,
 updates} = inputs;\n      const {shape} = attrs;\n      const out = backend.makeOutput(shape, updates.dtype);\n      if
 (util.sizeFromShape(shape) === 0) {\n        return out;\n      }\n      const {sliceRank, numUpdates, sliceSize, strides,
 outputSize} =\n        scatter_util.calculateShapes(updates, indices, shape);\n      const indicesData =
 backend.dataIdMap.get(indices.dataId);\n      const indicesId = indicesData.id;\n      const updatesData =
 backend.dataIdMap.get(updates.dataId);\n      const updatesId = updatesData.id;\n      const stridesBytes = new
 Uint8Array(new Int32Array(strides).buffer);\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmScatterNd(\n
        indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n        sliceSize,
 stridesBytes, outputSize, outId);\n      return out;\n    }\n\n  export const scatterNdConfig: KernelConfig = {\n
    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as
 KernelFunc\n  };}\n\n/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
 {BackendWasm} from './backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
 offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
 backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n
    'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: {inputs: SelectInputs, backend:
 BackendWasm}) {\n    const {inputs, backend} = args;\n    const {condition, t, e} = inputs;\n    const conditionId =
 backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId =
 backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId =
 backend.dataIdMap.get(out.dataId).id;\n    const cRank = condition.shape.length;\n    const tRank =
 t.shape.length;\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1:\n    util.sizeFromShape(t.shape.slice(1));\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as {} as
 KernelFunc,\n    setupFunc: setup\n  };}\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights
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 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
 void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /*

```

```

void */, [number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\nTensorInfo {\n  const { backend, inputs: { x } } = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out\n= backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-  
circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n}\n\nwasmFunc(xId,\noutId);\n  return out;\n}\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmFunc: (xId: number, outId:\nnumber, channels: number, batch: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n    'number', // xId\n    'number', // outId\n    'number', // channels\n    'number' // batch\n  ]);\n}\n\nfunction softmax(\n  args: { backend: BackendWasm,\n  inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\n  TensorInfo {\n  const { backend, inputs: { logits }, attrs: { dim } } =\n  args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape,\n  logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n  const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if\n  (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n}\n\nwasmFunc(xId, outId, channels, batch);\n  return\n  out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2021 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n  SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { padV2Config } from\n './PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\nfunction\n  spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:\n  SpaceToBatchNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockSize,\n  paddings } = attrs;\n  const prod = util.sizeFromShape(blockSize);\n  const completePaddings: Array<[number,

```

```

number]> = [[0, 0]];
  completePaddings.push(...(paddings as Array<[number, number]>));
  for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {
  completePaddings.push([0, 0]);
}
const paddedX =
padV2Config.kernelFunc({
  inputs: {x},
  backend,
  attrs: {paddings: completePaddings, constantValue:
0}
}) as TensorInfo;
const reshapedPaddedShape =
  backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);
const permutedReshapedPaddedPermutation = backend_util.getPermuted(
reshapedPaddedShape.length, blockShape.length, false);
const flattenShape =
backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);
const reshapeInputs:
ReshapeInputs = {x: paddedX};
const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};
const paddedXReshaped =
  reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});
const transposeInputs:
TransposeInputs = {x: paddedXReshaped};
const transposeAttrs:
  TransposeAttrs = {perm:
permutedReshapedPaddedPermutation};
const paddedXT =
  transpose({inputs: transposeInputs, backend,
attrs: transposeAttrs});
const resultReshapeInputs: ReshapeInputs = {x: paddedXT};
const
resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};
const result = reshape(
  {inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs});
backend.disposeData(paddedX.dataId);
backend.disposeData(paddedXReshaped.dataId);
backend.disposeData(paddedXT.dataId);
return
result;
}
export const spaceToBatchNDConfig: KernelConfig = {
  kernelName: SpaceToBatchND,
  backendName: 'wasm',
  kernelFunc: spaceToBatchND as { } as KernelFunc;
}
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 *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for
the specific language governing permissions and
 * limitations under the License.
 */
=====
*/
import {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';
import {backend_util} from '@tensorflow/tfjs-core';
import {BackendWasm} from
'./backend_wasm';
import {slice} from './Slice';
export function splitV(
  args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {
  const {inputs, attrs, backend} = args;
  const {x} = inputs;
  const
{numOrSizeSplits, axis} = attrs;
  const $axis = util.parseAxisParam(axis, x.shape)[0];
  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);
  const begin = new Array(x.shape.length).fill(0);
  const size = x.shape.slice();
  return splitSizes.map(s => {
    const xSliceSize = [...size];
    xSliceSize[$axis] =
s;
    const xSlice =
slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});
    begin[$axis] += s;
  });
}
export const splitVConfig: KernelConfig = {
  kernelName: SplitV,
  backendName:
'wasm',
  kernelFunc: splitV as { } as KernelFunc;
}
"/**
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 */
=====
*/
import {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';
import {createUnaryKernelConfig} from
'./unary_kernel';
export const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);
"/**
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 *
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 */

```

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```
=====\n\n*\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n *\n @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n\n
```

```
=====\n\n*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}\n from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig\n =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n *\n @license\n * Copyright\n 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n\n
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo}\n from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmStep:\n (xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n 'number', // alpha\n 'number', // dtype\n 'number', // out_id\n ]);\n}\n\nfunction step(\n args: {\n backend:\n BackendWasm, inputs: StepInputs, attrs: StepAttrs\n }):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId,\n alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName:\n Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n", "/*\n *\n @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n\n
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,\n util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from\n './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,\n xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes:\n Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction\n setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //\n outShapeLength\n 'number', // outId\n ]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n
```



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permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n  const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId !== xId) {\n    // transpose was
not a no-op. We will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId =
transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n      reductionAxes.length,
input.shape.length);\n  }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n  'sum', reductionAxes,
input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n  // dispose of
the transposed tensor.\n  backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n  // reshape\n  const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //
x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n
  ]);\n}\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n

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newShape[i] = x.shape[i] * reps[i];\n }
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out =
backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n   CppDType[out.dtype], outId);\n return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n}\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n  wasmTopK(\n    xId, xShapeBytes, x.shape.length,\n
CppType[x.dtype], k, sorted,\n    outValuesId, outIndicesId);\n  return [outValues, outIndices];\n
};\n\nexport const topkConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmTransform: (\n  imageId:
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n  'number', // imageId\n  'number', // transformsId\n  'bool', // isBatchTransform\n  'number',
// batch\n  'number', // outHeight\n  'number', // outWidth\n  'number', // numChannels\n  'number', //
imageWidth\n  'number', // imageHeight\n  'array', // strides\n  'number', // stridesLength\n  'number', //
interpolationModeId\n  'number', // fillModeId\n  'number', // fillValue\n  'number' // outId\n
]);\n}\n\nfunction transform(\n  args:\n  {backend: BackendWasm, inputs: TransformInputs, attrs:

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TransformAttrs});\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {image, transforms} = inputs;\n    const {interpolation, fillMode, fillValue, outputShape} = attrs;\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n    const [outHeight, outWidth] =\n      outputShape != null ? outputShape : [imageHeight, imageWidth];\n    const outShape =\n      [batch, outHeight, outWidth, numChannels] as [number, number, number, number];\n    const strides =\n      new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n    const out = backend.makeOutput(outShape, image.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const imageData = backend.dataIdMap.get(image.dataId);\n    const imageId = imageData.id;\n    const transformsData = backend.dataIdMap.get(transforms.dataId);\n    const transformsId = transformsData.id;\n    const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n    let fillModeId;\n    switch (fillMode) {\n      case 'constant':\n        fillModeId = 1;\n        break;\n      case 'reflect':\n        fillModeId = 2;\n        break;\n      case 'wrap':\n        fillModeId = 3;\n        break;\n      case 'nearest':\n        fillModeId = 4;\n        break;\n      default:\n        fillModeId = 1;\n    }\n  }\n\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight, outWidth, numChannels, imageWidth, imageHeight, strides, image.shape.length - 1, interpolationModeId, fillModeId, fillValue, outId);\n\n  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as {\n    KernelFunc\n  };,\n  "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {slice} from './Slice';\n\nfunction unpack(\n  args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs});\n  TensorInfo[] {\n    const {inputs, backend, attrs} = args;\n    const {value} = inputs;\n    let {axis} = attrs;\n    if (axis < 0) {\n      axis += value.shape.length;\n    }\n\n    const numOutputs = value.shape[axis];\n    const rank = value.shape.length;\n    const outShape: number[] = new Array(rank - 1);\n    let outIndex = 0;\n    for (let i = 0; i < rank; i++) {\n      if (i !== axis) {\n        outShape[outIndex++] = value.shape[i];\n      }\n    }\n    const outs: TensorInfo[] = new Array(numOutputs);\n    const begin = new Array(rank).fill(0);\n    const size = value.shape.slice();\n    size[axis] = 1;\n    for (let i = 0; i < outs.length; i++) {\n      begin[axis] = i;\n      outs[i] = slice({inputs: {x: value}, attrs: {begin, size, backend}});\n    }\n    return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n  }\n\nexport const unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as {\n    KernelFunc\n  };,\n  "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike

```


as { } as KernelFunc,\n};\n",/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

=====\n *\/\n//

We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}

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from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
 {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
 {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n\n"/**\n *
 @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
  copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
  passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
  contains SIMD\n // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
  Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
    11\n  ]));\n\n/**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
  feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
  TODO(annxingyuan): Enable node support once this is resolved:\n //
  https://github.com/tensorflow/tfjs/issues/3830\n  if (ENV.get('IS_NODE')) {\n    return false;\n  }\n\n  try {\n //
  Test for transferability of SABs (needed for Firefox)\n //
  https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n    new

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MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n ]));\n } catch (e) {\n return false;\n }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
})return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
})return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram="/.this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"\\"}else{scriptDirectory=__dirname+"\\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\");arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insep
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof

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read!=="undefined"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !== "undefined" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("\^")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+"", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str===null&&str===undefined&&str===0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]

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]=args[i] } } var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==(0))stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)} }function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){ var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){ str+=String.fromCharCode(u0);continue } var
u1=heap[idx++]&63;if((u0&224)==192){ str+=String.fromCharCode((u0&31)<<6|u1);continue } var
u2=heap[idx++]&63;if((u0&240)==224){ u0=(u0&15)<<12|u1<<6|u2 } else { u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63 } if(u0<65536){ str+=String.fromCharCode(u0) } else { var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) } } return str }function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):"" }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){ if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length; ++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023 } if(u<=127){ if(outIdx>=endIdx)break;heap[outIdx++
]=u } else if(u<=2047){ if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63 } else
if(u<=65535){ if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63 } else { if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63 } } heap[outIdx]=0;return outIdx-startIdx }function
stringToUTF8(str,outPtr,maxBytesToWrite){ return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite) }function lengthBytesUTF8(str){ var
len=0;for(var i=0;i<str.length; ++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4 } return len }function
writeArrayToMemory(array,buffer){ GROWABLE_HEAP_I8().set(array,buffer) }function
alignUp(x,multiple){ if(x%multiple>0){ x+=multiple-x%multiple } return x } var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){ buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf) } var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){ wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]} else { if(Module["wasmMemory"]){ wasmMemory=
Module["wasmMemory"]} else { wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){ err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){ console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)") } throw Error("bad
memory") } } if(wasmMemory){ buffer=wasmMemory.buffer } INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var

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runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){addOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].length){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a pthread worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module["preloadedAudios"]={};function abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error("Pthread aborting at "+(new Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the wasm failed"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at "+wasmBinaryFile+""}return response["arrayBuffer"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)}))}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency("wasm-

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instantiate\"))}})} if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\\"wasm-instantiate\")}function
receiveInstantiatedSource(output){receiveInstance(output[\\\"instance\\\"],output[\\\"module\\\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err(\\\"failed to asynchronously prepare
wasm: \\\"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\\\"function\\\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\\\"function\\\"){return fetch(wasmBinaryFile,{credentials:\\\"same-
origin\\\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\\\"wasm streaming compile failed: \\\"+reason);err(\\\"falling
back to ArrayBuffer instantiation\\\")});return instantiateArrayBuffer(receiveInstantiatedSource)}})else{return
instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\\\"instantiateWasm\\\"]){try{var
exports=Module[\\\"instantiateWasm\\\"](info,receiveInstance);return exports}catch(e){err(\\\"Module.instantiateWasm
callback failed with error: \\\"+e);return false}}instantiateAsync().catch(rejectedPromise);return{}}var
ASM_CONSTS={10520:function(){throw\\\"Canceled!\\\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\\\"function\\\"){callback(Module);continue}var func=callback.func;if(typeof
func===\\\"number\\\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg
)}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOCSS:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADF:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\\\"Atomics.notify returned an unexpected value
\\\"+ret}Module[\\\"__emscripten_futex_wake\\\"]=__emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\\\"Internal Error! killThread() can only ever be
called from main application thread!\\\";if(!pthread_ptr)throw\\\"Internal Error! Null pthread_ptr in

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killThread!";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cancelThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cancelThread!";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({"cmd\":"cancel"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! cleanupThread() can only
ever be called from main application thread!";if(!pthread_ptr)throw"Internal Error! Null pthread_ptr in
cleanupThread!";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)} } var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb);initWorker:function(){,threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone"})},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeThr
eadData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null },returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n(){delete
PThread.threads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;

```



```

if(d["targetThread"]&&d["targetThread"]!="_pthread_self"){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d["targetThread"]+', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\'processQueuedMainThread
Work\'){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\'spawnThread\'){spawnThread(e.data)}else
if(cmd===\'cleanupThread\'){cleanupThread(d["thread"])}else
if(cmd===\'killThread\'){killThread(d["thread"])}else
if(cmd===\'cancelThread\'){cancelThread(d["thread"])}else
if(cmd===\'loaded\'){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\'print\'){out("Thread \'"+d["threadId"]+\'":
\'"+d["text"])}else if(cmd===\'printErr\'){err("Thread \'"+d["threadId"]+\'": \'"+d["text"])}else
if(cmd===\'alert\'){alert("Thread \'"+d["threadId"]+\'": \'"+d["text"])}else if(cmd===\'exit\'){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\'exitProcess\'){try{exit(d["returnCode"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\'cancelDone\'){PThread.returnWorkerToPool(worker)}else
if(cmd===\'objectTransfer\'){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\'setimmediate\'){worker.postMessage(e.data)}else{err("worker sent an unknown command
\'"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err("pthread sent
an error! \'"+e.filename+\'":\'"+e.lineno+\'":
\'"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on("message",function(data){worker.onmessage({data:d
ata}));worker.on("error",function(data){worker.onerror(data)});worker.on("exit",function(data){})}worker.post
Message({"cmd":\'load\',\'urlOrBlob\':Module["mainScriptUrlOrBlob"]|_scriptDir,\'wasmMemory\':wasmMe
mory,\'wasmModule\':wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile("tfjs-
backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)},getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module["establishStackSpace"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module["getNoExitRuntime"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module["invokeEntryPoint"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort("Assertion failed: \''+UTF8ToString(condition)+'', at:
\'"+[filename?UTF8ToString(filename):\'unknown filename\',line,func?UTF8ToString(func):\'unknown
function\'])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process["hrtime"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module["__performance_now_clock_drift"]}}else if(typeof
dateNow!=='undefined'){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId===mainThreadId){postMessag
e({"cmd":\'processQueuedMainThreadWork\'})}else

```

```

if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread":targetThreadId,"cmd"::"processThreadQueue"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd"::"processThreadQueue"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retu
rn ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var

```

```

JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-1;i>=0;--i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListeners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListeners);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";if(target==screen)return"#screen";return target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}},function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32()[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[varargs+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestore

```

```

e(stackTop)}function
_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=targetCanvas?UTF8ToString(targetCanvas):"";_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height)}function maybeCStringToJsString(cString){return cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function findEventTarget(target){target=maybeCStringToJsString(target);var domElement=specialHTMLTargets[target]||(typeof document!=="undefined"?document.querySelector(target):undefined);return domElement}function findCanvasEventTarget(target){return findEventTarget(target)}function _emsripten_set_canvas_element_size_calling_thread(target,width,height){var canvas=findCanvasEventTarget(target);if(!canvas)return-4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prevViewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}else if(canvas.canvasSharedPtr){var targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function _emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)return _emsripten_proxy_to_main_thread_js(2,1,target,width,height);return _emsripten_set_canvas_element_size_calling_thread(target,width,height)}function _emsripten_set_canvas_element_size(target,width,height){var canvas=findCanvasEventTarget(target);if(canvas){return _emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return _emsripten_set_canvas_element_size_main_thread(target,width,height)}}function _emsripten_set_current_thread_status(newStatus){}function _emsripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var ext=ctx.getExtension("OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao){return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffersWEBGL"](n,bufs)};return 1}}function __webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_draw"))}var GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return

```

```

ret},getSource:function(shader,count,string,length){var source="\n";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\nwebgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===undefined||JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\n
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\nlose_context")<0&&ext.inde
xOf("\ndebug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\n"){name=name.slice(0,name.lastIndexOf("\n"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GLctx.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\n"+j+"\n";loc=GLctx.getUniformLocation(p,n);id=GLctx.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["\ndefault","\nlow-power","\nhigh-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"\nalpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"\ndepth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"\nstencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"\nantialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"\np
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"\npreserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"\npowerPreference":__emscripten_webgl_power_preferences[powerPreference],"\nfailIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var

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contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emsripten_webgl_create_context(a0,a1){return _emsripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emsripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(5,1,fd,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emsripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd":"run","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer==="undefined"){err("Current
environment does not support SharedArrayBuffer, pthreads are not available!");return
6}if(!pthread_ptr){err("pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emsripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var

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allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw"Canceled!"}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/threads.html#blocking-on-the-main-browser-thread")}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err("pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()==thread){err("PThread
"+thread+" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err("Main thread
"+thread+" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!=thread){err("pthread_join attempted on thread
"+thread+", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
"+thread+", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return

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255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wri
te,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"
asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).app

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ly(null,arguments));var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"]["U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["ma"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["pa"]).apply(null,arguments)};

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s});var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm\"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm\"][["ra"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm\"][["sa"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm\"][["ta"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm\"][["ua"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm\"][["va"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm\"][["wa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm\"][["xa"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm\"][["ya"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm\"][["za"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm\"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm\"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm\"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm\"][["Da"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm\"][["Ea"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm\"][["Fa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm\"][["Ga"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm\"][["Ha"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm\"][["Ia"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm\"][["Ja"]]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm\"][["Ka"]]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm\"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm\"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm\"][["Na"]]).app

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ly(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["_a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)}

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});var
__errno_location=Module[\"__errno_location\"]=function(){return(__errno_location=Module[\"__errno_locati
on\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscipten_get_global_libc=Module[\"_emscipten_get_global_libc\"]=function(){return(_emscipten_get_global
_libc=Module[\"_emscipten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_thread_self=Module[\"_thread_self\"]=function(){return(_thread_self=Module[\"_thread_self\"]=Module[\"as
m\"][\"mb\"]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module[\"__pthread_tsd_run_dtors\"]=function(){return(__pthread_tsd_run_dtors=M
odule[\"__pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscipten_main_thread_process_queued_calls=Module[\"_emscipten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscipten_main_thread_process_queued_calls=Module[\"_emscipten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscipten_current_thread_process_queued_calls=Module[\"_emscipten_current_thread_process_queued_calls\"]
=function(){return(_emscipten_current_thread_process_queued_calls=Module[\"_emscipten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscipten_register_main_browser_thread_id=Module[\"_emscipten_register_main_browser_thread_id\"]=functi
on(){return(_emscipten_register_main_browser_thread_id=Module[\"_emscipten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscipten_main_browser_thread_id=Module[\"_emscipten_main_browser_thread_id\"]=function(){return(_emsc
ipten_main_browser_thread_id=Module[\"_emscipten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emscipten_do_dispatch_to_thread=Module[\"__emscipten_do_dispatch_to_thread\"]=function(){return(__emsc
ipten_do_dispatch_to_thread=Module[\"__emscipten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emscipten_sync_run_in_main_thread_4=Module[\"_emscipten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscipten_sync_run_in_main_thread_4=Module[\"_emscipten_sync_run_in_main_thread_4\"]=Module[\"asm\
\"][\"tb\"]).apply(null,arguments)};var
_emscipten_run_in_main_runtime_thread_js=Module[\"_emscipten_run_in_main_runtime_thread_js\"]=function(
){return(_emscipten_run_in_main_runtime_thread_js=Module[\"_emscipten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscipten_call_on_thread=Module[\"__emscipten_call_on_thread\"]=function(){return(__emscipten_call_on_t
hread=Module[\"__emscipten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscipten_tls_init=Module[\"_emscipten_tls_init\"]=function(){return(_emscipten_tls_init=Module[\"_emscipt
en_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscipten_thread_init=Module[\"__emscipten_thread_init\"]=function(){return(__emscipten_thread_init=Mod
ule[\"__emscipten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\
\"][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\
\"]).apply(null,arguments)};var
_emscipten_stack_set_limits=Module[\"_emscipten_stack_set_limits\"]=function(){return(_emscipten_stack_set_
limits=Module[\"_emscipten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscipten_allow_main_runtime_queued_calls=Module[\"__emscipten_allow_main_runtime_queued_calls\"]=1
0512;var

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__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\\)\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\": \"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\\\"),1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\": \"exitProcess\", \"returnCode\": status});throw new
ExitStatus(status)}else{}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"]Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\\n\\n return WasmBackendModuleThreadedSimd.ready\\n\\n);\\n);\\nif (typeof exports === 'object' && typeof
module === 'object')\\n module.exports = WasmBackendModuleThreadedSimd;\\nelse if (typeof define ===
'function' && define['amd'])\\n define([], function() { return WasmBackendModuleThreadedSimd; });\\nelse if
(typeof exports === 'object')\\n exports[\"WasmBackendModuleThreadedSimd\"] =
WasmBackendModuleThreadedSimd;\\n\", \"export const wasmWorkerContents = 'var Module={ };function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join(
\\\"\\\";postMessage({ cmd: \"alert\", text: text, threadId: Module[\"_pthread_self\"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wa
smModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;
Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](),1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[
\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!==\"unwind\")if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]())}else{Module[\"PThread\"].threadExit(ex.status)}}el

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se{Module["PThread"].threadExit(-2);throw ex}} }else
if(e.data.cmd==="cancel"){if(Module["_pthread_self"]){Module["PThread"].threadCancel()} }else
if(e.data.target==="setimmediate"){ } else
if(e.data.cmd==="processThreadQueue"){if(Module["_pthread_self"]){Module["_emscripten_current_thread_
process_queued_calls"]()} }else{err("worker.js received unknown command
"+e.data.cmd);err(e.data)} }catch(ex){err("worker.js onmessage() captured an uncaught exception:
"+ex);if(ex&&ex.stack)err(ex.stack);throw ex } };if(typeof process==="object"&&typeof
process.versions==="object"&&typeof process.versions.node==="string"){self={location:{href: __filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require("worker_threads");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on("message",function(data){ onmessage({ data:data})});var
nodeFS=require("fs");var nodeRead=function(filename){return nodeFS.readFileSync(filename,"utf8")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f)});postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance==="undefined"){performance={now:function(){return Date.now()}}};";\nvar
WasmBackendModule = (function() {\n var _scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined')
_scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule =
WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!=="undefined"?WasmBackendModule: {} ;var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] }}var arguments_=[];var
thisProgram= "./this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)} assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex } });process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return "[Emscripten Module object]"} }else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)} }readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof

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arguments!=="undefined"){arguments_=arguments}if(typeof
quit===\function\"){quit_=function(status){quit(status)}if(typeof print!=="undefined"){if(typeof
console===\undefined\"){console={};console.log=print;console.warn=console.error=typeof
printErr!=="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\blob:\")!=0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\^")+1)}else{scriptDirectory=""}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} else { var
out=Module[\print\]||console.log.bind(console);var err=Module[\printErr\]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\arguments\])arguments_=Module[\arguments\];if(Module[\thisProgram\])thisProgram=
Module[\thisProgram\];if(Module[\quit\])quit_=Module[\quit\];var
wasmBinary;if(Module[\wasmBinary\])wasmBinary=Module[\wasmBinary\];var
noExitRuntime=Module[\noExitRuntime\]||true;if(typeof WebAssembly!=="object"){abort(\no native wasm
support detected)}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\Assertion failed: "+text)}}function getCFunc(ident){var
func=Module[\_"+ident];assert(func,\Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC=\string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\string\)return UTF8ToString(ret);if(returnType===\boolean\)return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\number\});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function

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```

UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;+i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=Module["preRun"];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=Module["postRun"];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepen
dencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort(\n"+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function

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getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\function\&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\same-
origin\}).then(function(response){if(!response[\ok\]){throw"failed to load wasm binary file at
\"+wasmBinaryFile+\"}return response[\arrayBuffer\]()}).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\asm\]=exports;wasmMemory=Module[\asm\][\j\];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module[\asm\][\r\];removeRunDependency(\wasm-
instantiate\)}addRunDependency(\wasm-instantiate\);function
receiveInstantiatedSource(output){receiveInstance(output[\instance\])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function\&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function\){return fetch(wasmBinaryFile,{credentials:\same-
origin\}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\wasm streaming compile failed: \"+reason);err(\falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\instantiateWasm\]){try{var
exports=Module[\instantiateWasm\](info,receiveInstance);return exports}catch(e){err(\Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(rejectPromise);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\function\){callback(Module);continue}var func=callback.func;if(typeof
func===\number\){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iovcnt,pnum){var num=0;for(var

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i=0;i<iocvnt;i++){ var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1 } }setErrNo(28);return-1 }var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var

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_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"])[["z"]]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"])[["A"]]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"])[["B"]]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"])[["C"]]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"])[["D"]]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"])[["E"]]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"])[["F"]]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"])[["G"]]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"])[["H"]]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"])[["I"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"])[["J"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"])[["K"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"])[["L"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"])[["M"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"])[["N"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"])[["O"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"])[["P"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"])[["Q"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"])[["R"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"])[["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"])[["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"])[["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"])[["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"])[["W"]]).apply(null,arguments)};var

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_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_X]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_Y]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_Z]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_$]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_aa]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_ba]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_ca]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_da]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_ea]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_fa]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_ga]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_ha]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_ia]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_ja]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_ka]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_la]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_ma]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_na]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_oa]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_pa]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_qa]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_ra]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_sa]).apply(null,arguments)};var

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_ReluParam=Module["_ReluParam"]=function(){return(_ReluParam=Module["_ReluParam"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_ReluParam6=Module["_ReluParam6"]=function(){return(_ReluParam6=Module["_ReluParam6"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"za"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"La"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][_"Ma"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][_"Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][_"Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][_"Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][_"Qa"]).apply(null,arguments)};var

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_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"])[_R
a]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"])[_Sa]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"])[_Ta]).apply(nu
ll,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"])[_Ua]).apply(null,argument
s)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"])[_Va]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"])[_Wa]).
apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][_Xa]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"])[_Ya\
]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name=_ExitStatus;this.message=_Program terminated with
exit(_+status+)};this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"](_Running...);setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](_),1});doRun(),1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]==_function)Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n);};\n\n\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define[_amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[_WasmBackendModule] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\n\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';\n\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\n\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n

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this.wasm.tfjs.initWithThreadsCount(threadsCount);\n  actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n  this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape:\n  number[], dtype: DataType):\n    DataId {\n      const dataId = {id: this.dataIdNextNumber++};\n      this.move(dataId, values, shape, dtype, 1);\n      return dataId;\n    }\n\n  numDataIds(): number {\n    return\n    this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start =\n    util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n    dataId:\n    DataId, values: backend_util.BackendValues, shape: number[],\n    dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n        dataId,\n        {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n    }\n    return;\n  }\n\n  const size = util.sizeFromShape(shape);\n  const numBytes = size *\n  util.bytesPerElement(dtype);\n  const memoryOffset = this.wasm._malloc(numBytes);\n  this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n  this.wasm.tfjs.registerTensor(id, size,\n  memoryOffset);\n  if (values != null) {\n    this.wasm.HEAPU8.set(\n      new Uint8Array(\n        (values\n        as backend_util.TypedArray).buffer,\n        (values as backend_util.TypedArray).byteOffset, numBytes),\n      memoryOffset);\n  }\n  }\n\n  read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return\n    this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset,\n    dtype, shape, stringBytes} =\n    this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n      memoryOffset,\n      memoryOffset +\n      util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false\n   * otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =\n      this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n    }\n    this.dataIdMap.delete(dataId);\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =\n      this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision():\n  32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:\n    false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this\n   * method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated\n   * elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape:\n  number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n    let dataId: {};\n    if (memoryOffset\n    == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id =\n      this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,\n      refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size,\n      memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}:\n  TensorInfo):\n  backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const\n    {memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new\n        Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n        return new Uint8Array(buffer, memoryOffset,\n        size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n\n  function\n  createInstantiateWasmFunc(path: string) {\n    // this will be replace by rollup plugin patchWechatWebAssembly in\n    // miniprogram's output.\n    // tslint:disable-next-line:no-any\n    return (imports: any, callback: any) => {\n      util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n        if (!response['ok']) {\n
```



```

});\n });\n\nfunction typedArrayFromBuffer(\n  buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n  switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer);\n    case
'int32':\n      return new Int32Array(buffer);\n    case 'bool':\n      return new Uint8Array(buffer);\n    default:\n
throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\n\nconst
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*\n * export function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n    ' ' will be removed in a future release.);\n  if
(initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n
      '\n      `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n  }\n  wasmPath = path;\n  customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * `js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
`\n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * \n * @doc {heading:
'Environment', namespace: 'wasm'}\n * \n * export function setWasmPaths(\n  prefixOrFileMap: string|{\n    [key in
WasmBinaryName]?: string\n  },\n  usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n      '\n      `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n      '\n      `tf.ready()`);\n  }\n  \n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix
= prefixOrFileMap;\n  } else {\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n      wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new
Error(\n        `There were no entries found for the following binaries: ` +\n        `${missingPaths.join(',')}`. Please
either call setWasmPaths with a ` +\n        `map providing a path for each binary, or with a string indicating ` +\n
        `the directory where all the binaries can be found.`);\n    }\n  }\n  \n  customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. *\n * export function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n
wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * \n * This must be called before calling
`tf.setBackend('wasm')`.\n * \n * export function setThreadsCount(numThreads: number) {\n  threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n * \n * It is set after the
backend is intialized.\n * \n * export function getThreadsCount(): number {\n  if (actualThreadsCount === -1) {\n
throw new Error(`WASM backend not initialized.`);\n  }\n  return actualThreadsCount;\n}\n\n"/** @license See the
LICENSE file. *\n */\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\n\nexport
{version};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport './flags_wasm';\nimport {registerBackend} from '@tensorflow/tfjs-core';\nimport {BackendWasm, init} from './backend_wasm';\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n  const {wasm} = await init();\n  return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n], "names": ["_FusedMatMul", "util", "Abs", "backend_util", "Add", "AddN", "Identity", "setup", "Transpose", "All", "Any", "wasmFunc", "ArgMax", "AvgPool", "Reshape", "BatchMatMul", "slice_util", "buffer", "sliceImplCPU", "Slice", "BatchToSpaceND", "Cast", "Ceil", "ClipByValue", "concatImplCPU", "Concat", "Conv2D", "Conv2DBackpropInput", "Cos", "Cosh", "CropAndResize", "Cumsum", "DepthToSpace", "DepthwiseConv2dNative", "Elu", "supportsFullBroadcast", "Equal", "Exp", "ExpandDims", "Fill", "FlipLeftRight", "Floor", "FloorDiv", "FusedBatchNorm", "FusedConv2D", "FusedDepthwiseConv2D", "GatherNd", "GatherV2", "Greater", "GreaterEqual", "setupFunc", "LeakyRelu", "Less", "LessEqual", "Log", "LogicalAnd", "Max", "Maximum", "MaxPool", "Mean", "Min", "Minimum", "MirrorPad", "Multiply", "Neg", "NonMaxSuppressionV3", "NonMaxSuppressionV4", "NonMaxSuppressionV5", "kernelFunc", "NotEqual", "OneHot", "OnesLike", "Pack", "PadV2", "Pow", "Prelu", "Prod", "rangeImplCPU", "Range", "RealDiv", "Relu", "Relu6", "ResizeBilinear", "Reverse", "RotateWithOffset", "Round", "Rsqrt", "ScatterNd", "Select", "Sigmoid", "Sin", "Softmax", "SpaceToBatchND", "SplitV", "Sqrt", "Square", "SquaredDifference", "Step", "StridedSlice", "Sub", "Sum", "Tan", "Tanh", "Tile", "TopK", "Transform", "Unpack", "ZerosLike", "registerKernel", "env", "require$$0", "require$$1", "require$$2", "global", "require$$3", "require$$4", "tslib_1.__extends", "DataStorage", "engine", "KernelBackend", "wasmFactoryThreadedSimd", "wasmFactory", "deprecationWarn", "registerBackend"], "mappings": ";;;;;;;;;;EAAA;;;;;;;;;;;EaIbA;EACA,IAAY,QAMX;EAND,WAAY,QAAQ;MACIB,6CAAW,CAA;MACX,yCAAS,CAA;MACT,uCAAQ,CAA;MACR,2CAAU,CAA;MACV,iDAAa,CAA;EACf,CAAC,EANW,QAAQ,KAA R,QAAQ,QAMnB;EAED;EACA,IAAY,iBAQX;EARD,WAAY,iBAAiB;MAC3B,6DAAU,CAA;MACV,yDAA Q,CAA;MACR,2DAAS,CAA;MACT,2DAAS,CAA;MACT,mEAAa,CAA;MACb,+DAAW,CAA;MACX, uDAAO,CAA;EACT,CAAC,EARW,iBAAiB,KAAjB,iBAAiB;;EC3B7B;;;;;;;EAuBA,IAAI,eAKQ,CAAC;EAEb,SAAS,KAAK,CAAC,OAAoB;MACjC,eAAe,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAACA,qBAAY, EAAE,IAAI,aAAa;UACIE,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;UACR,OAAO;UACP,QAAQ;UA CR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CA AC,CAAC;EAEL,CAAC;EAED,SAAS,gBAAGb,CAAC,IAIzB;MACQ,IAAA,oBAAM,EAAE,sBAAO,EAAE,kB AAK,CAAS;MAC/B,IAAA,YAAC,EAAE,YAAC,EAAE,kBAAI,EAAE,sDAAsB,CAAW;MAEpD,IAAI,CAAC,C AAC,KAAK,KAAK,SAAS,IAAI,CAAC,CAAC,KAAK,KAAK,SAAS,EAAE;UACID,MAAM,IAAI,KAAK,CAC X,6DAA6D,CAAC,CAAC;OACpE;MAEM,IAAA,6BAAU,EAAE,6BAAU,EAAE,6BAAU,EAAE,qCAAc,CAAU; MACnE,IAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC, EAAE,CAAC;MAC/C,IAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM, CAAC,CAAC,EAAE,CAAC;MAE/C,IAAI,MAAM,GAAG,CAAC,CAAC;MACf,IAAI,IAAI,IAAI,IAAI,EAAE;U AChB,IAAM,QAAQ,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC;UA CpD,IAAI,QAAQ,CAAC,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;cAC/B,MAAM,IAAI,KAAK,CACX,iDA AiD;mBACjD,UAAQ,QAAQ,CAAC,KAAK,CAAC,MAAM,MAAG,CAA,CAAC,CAAC;WACvC;UACD,MAA M,GAAG,QAAQ,CAAC,EAAE,CAAC;OACTb;MACD,IAAM,wBAAwB,GAAG,sBAAsB,IAAI,IAAI;UAC3D,C AAC;UACD,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC; MAC5D,IAAM,eAAe,GACjB,iBAAiB,CAAC,UAAkD,CAAC,CAAC;MAC1E,IAAI,eAAe,IAAI,IAAI,EAAE;UA C3B,MAAM,IAAI,KAAK,CACR,UAAU,mDAAgD;cAC7D,sBAAsB,CAAC,CAAC;OAC7B;MAED,IAAM,OAA O,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,CAA C,CAAC,CAAC;MACfD,IAAM,QAAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAA G,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC;MACtD,IAAM,QAAQ,GAAG,CAAC,CAAC,KAAK,CAA C,CAAC,CAAC,CAAC;MAE5B,IAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAA
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No license file was found, but licenses were detected in source scan.

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```

rank at least 1, got: ${x.shape.length}`);
\n\n  const size = slice_util.computeOutShape($begin, $end, $strides);
\n  // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).
\n  const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});
\n  result =\n    reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});
\n  backend.disposeData(sliced.dataId);
\n } else {\n  const out =
backend.makeOutput(finalShapeSparse, 'float32');
\n\n  const xId = backend.dataIdMap.get(x.dataId).id;
\n  const
xStridesBytes =\n    new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);
\n  const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);
\n  const endBytes = new Uint8Array(new
Int32Array($end).buffer);
\n  const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);
\n\n  const
outputShapeBytes =\n    new Uint8Array(new Int32Array(finalShapeSparse).buffer);
\n  const outStridesBytes =
new Uint8Array(\n    new Int32Array(util.computeStrides(finalShapeSparse)).buffer);
\n  const outId =
backend.dataIdMap.get(out.dataId).id;
\n\n  wasmStridedSlice(\n    xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n    outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);
\n\n  result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});
\n\n  backend.disposeData(out.dataId);
\n }
\n\n return result;
\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as {} as KernelFunc\n};
\n}}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/StridedSlice.js.map

```

No license file was found, but licenses were detected in source scan.

```

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entity.ts","../src/kernels/Transpose.ts","../src/kernels/All.ts","../src/kernels/kernel_utils.ts","../src/kernels/Any.ts","../s
rc/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../nod
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CropAndResize.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthTo
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ls/NonMaxSuppressionV3.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression
_util.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/OneHot.
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s","../node_modules/@tensorflow/tfjs-backend-
cpu/dist/kernels/Range_impl.js","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/ker
nels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/ScatterNd.ts","../src/kernels/Round.ts","../src/ker
nels/Rsqrt.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Softmax.ts","../src/kernels/Sin.ts","..
../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Step.ts","../src/kernels/Sqrt.ts","../src/kerne

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ls/Square.ts", "../src/kernels/SquaredDifference.ts", "../src/kernels/StridedSlice.ts", "../src/kernels/Sum.ts", "../src/kernels/Sub.ts", "../src/kernels/Tile.ts", "../src/kernels/Tan.ts", "../src/kernels/Tanh.ts", "../src/kernels/TopK.ts", "../src/kernels/Transform.ts", "../src/kernels/Unpack.ts", "../src/register_all_kernels.ts", "../src/kernels/ZerosLike.ts", "../src/flags_wasm.ts", "../wasm-out/tfjs-backend-wasm-threaded-simd.js", "../wasm-out/tfjs-backend-wasm.js", "../src/backend_wasm.ts", "../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js", "../src/base.ts", "../src/version.ts"], "sourcesContent": ["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { FusableActivation } from './types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, activation: number, biasId: number, preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number' // out_id\n  ]);\n\n  function fusedBatchMatMul(args: {\n    inputs: _FusedMatMulInputs,\n    backend: BackendWasm,\n    attrs: _FusedMatMulAttrs\n  }) {\n    const { inputs, backend, attrs } = args;\n    const { a, b, bias, preluActivationWeights } = inputs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(\n        `_FusedMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n\n    let biasId = 0;\n    if (bias !== null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `_FusedMatMul only supports rank-1 bias but got ` +\n            `rank ${biasData.shape.length}.`);\n      }\n      biasId = biasData.id;\n    }\n\n    const preluActivationWeightsId = preluActivationWeights == null ?\n      0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n    const fusedActivation =\n      FusableActivation[activation as { } as keyof typeof FusableActivation];\n    if (fusedActivation == null) {\n      throw new Error(\n        `${activation} activation not yet supported for FusedConv2D` +\n          ` in the wasm backend.`);\n    }\n\n    const leftDim = transposeA ? a.shape[2] : a.shape[1];\n    const rightDim = transposeB ? b.shape[1] : b.shape[2];\n    const batchDim = a.shape[0];\n\n    const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new Uint8Array(new

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Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  transposeA,\n  transposeB, fusedActivation, biasId, preluActivationWeightsId,\n  leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n  kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n  'number', // x_id\n  'number', // dtype\n
'number', // out_id\n  ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs});\n\n
TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const
out = backend.makeOutput(x.shape, outType || x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n
wasmFunc(xId, CppDType[x.dtype], outId);\n  return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport
function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:
DataType): KernelConfig {\n let wasmFunc:\n  (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n  bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n function
setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(kernelName, null /*
void */, [\n  'number', // a_id,\n  'array', // a_shape\n  'number', // a_shape.length\n  'number', // b_id\n
'array', // b_shape\n  'number', // b_shape.length\n  'number', // dtype\n  'number' // out_id\n  ]);\n }\n\n
function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs});\n\n TensorInfo {\n  const {backend,

```



```

inputs } = args;\n  const {a, b} = inputs;\n  const aId = backend.dataIdMap.get(a.dataId).id;\n  const bId =
backend.dataIdMap.get(b.dataId).id;\n\n  const outputType = dtype != null ? dtype : a.dtype;\n  const newShape =
backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n  const out = backend.makeOutput(newShape,
outputType);\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(newShape) === 0) {\n    return
out;\n  }\n\n  const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n  const bShapeBytes =
new Uint8Array(new Int32Array(b.shape).buffer);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
const kernelFunc = () => wasmFunc(\n    aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n    CppDType[a.dtype], outId);\n\n  // Currently only some float operations support full broadcast.\n  if
(supportsFullBroadcast && a.dtype === 'float32') {\n    kernelFunc();\n    return out;\n  }\n\n  const
aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n  const bBroadcastDims =
backend_util.getBroadcastDims(b.shape, newShape);\n  const loopsOverAllOfA = aBroadcastDims.every((v, i) =>
v === i);\n  const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n  if (loopsOverAllOfA &&
loopsOverAllOfB) {\n    kernelFunc();\n    return out;\n  } else {\n    throw new Error(\n      `Broadcasting
along outer dims is not yet `+\n      `supported for ${a.dtype} ${kernelName}.`);\n  }\n}\n\n  return
{kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n
createBinaryKernelConfig(Add, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc:\n (inputIds:
Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:
BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n    'array', // input_ids\n
'number', // input_ids.length\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction addn(args: {inputs:
TensorInfo[], backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const out =
backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n  // Short-circuit zero-sized tensors.\n  if
(util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  const inputIds = inputs.map(x =>
backend.dataIdMap.get(x.dataId).id);\n  const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n
const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmFunc(inputIdsBytes, inputIds.length,
CppType[out.dtype], outId);\n\n  return out;\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName:
AddN,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: addn as { } as KernelFunc,\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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```
=====\n\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, backend} =\n  args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'wasm',\n  kernelFunc: identity as {} as\n  KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from\n './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,\n  xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n  void *, [\n  'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // dtype\n  'number', // outId\n  'array', // perm\n  'number', // perm.length\n  ]);\n}\n\nexport function transpose(\n  args:\n  {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n  TensorInfo {\n  const {inputs,\n  backend, attrs} = args;\n  // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n  // better\n  // due to simpler memory access pattern.\n  const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n  attrs.perm);\n  let permIsNoOp = true;\n  for (let i = 0; i < perm.length; i++) {\n    if (perm[i] !== i) {\n      permIsNoOp = false;\n    }\n  }\n  const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n  const x = {\n  dataId: inputs.x.dataId,\n  shape: reducedShape,\n  dtype: inputs.x.dtype\n  };\n  if (permIsNoOp) {\n    const\n  cloned = identity({inputs, backend});\n    cloned.shape = outShape;\n    return cloned;\n  }\n  const out =\n  backend.makeOutput(outShape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId =\n  backend.dataIdMap.get(out.dataId).id;\n  const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  wasmTranspose(\n    xId,\n    xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n    perm.length);\n  return\n  out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new\n  Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n  return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]\n  {\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if\n  (shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n     \n  newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =\n  0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n      (minValIdx === -1 || newPerm[minValIdx] >\n      newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,\n  newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:\n  'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright\n * 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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```
=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAll: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null\n /*void*/, ['number, number, number']);\n}\n\nfunction all(args: { backend: BackendWasm, inputs: AllInputs, attrs:\n AllAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x\n = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const\n { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if\n (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =\n transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =\n util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if\n (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return\n out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:\n setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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=====\n*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from\n './backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose\n if necessary.\n *\n * Used by reduction ops.\n *\n * @param x input TensorInfo\n * @param axis reduction axes\n *\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[],\n  backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n } {\n  const xShape = x.shape;\n  const xRank =\n x.shape.length;\n\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const\n permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let\n inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n\n    axes =\n backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({ inputs: { x }, attrs: { perm:\n permutedAxes }, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =\n backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n\n  return { transposed: xTransposed, originalAxes, axes, inputWasTransposed };\n}\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *  
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```
=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,\n  null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,\n  attrs: AnyAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis,\n    backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =\n    util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if\n    (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =\n      backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return\n  out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:\n  setup,\n  kernelFunc: any as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n  Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n  except in compliance with the License.\n * You may obtain a copy of the License at\n *\n  http://www.apache.org/licenses/LICENSE-2.0\n *\n  * Unless required by applicable law or agreed to in writing,\n  software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n  * limitations under the License.\n *
```

```
=====\n*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-\n  core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from\n './kernel_utils';\nimport { CppDType } from './types';\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:\n  number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n}\n\nfunction argmax(\n  args:\n  { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n  const { backend, inputs, attrs } = args;\n  const { axis } = attrs as { } as ArgMaxAttrs;\n  const { x } = inputs as { } as ArgMaxInputs;\n  const xId =\n    backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes,\n    inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose\n      was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =\n      transposedId;\n    }\n  }\n\n  const outShape = input.shape.slice(0, -1);\n  const out =\n    backend.makeOutput(outShape, 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const outerSize =\n    util.sizeFromShape(out.shape);\n  const innerSize = input.shape[axes[0]];\n  wasmFunc(inputId,\n  CppDType[input.dtype], outerSize, innerSize, outId);\n\n  if (inputWasTransposed) {\n    // dispose of the\n    transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  return out;\n}\n\nexport const\n  argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as { }\n  as KernelFunc,\n  setupFunc: setup\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n*\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from  
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:  
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:  
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n  strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n  ]);\n}\n\nfunction  
avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs,  
backend} = args;\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const  
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n  const filterHeight =  
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const  
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =  
convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const channels = convInfo.inChannels;\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend does not support dataFormat: ` +\n      `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n      `was backend  
only supports average pooling with dilation = [1, 1], ` +\n      `got [${convInfo.dilationHeight},  
${convInfo.dilationWidth}].`);\n  }\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const  
outId = backend.dataIdMap.get(out.dataId).id;\n  wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],  
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */
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```
=====\n*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-  
core';\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n  args: {inputs:  
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} =  
inputs;\n  const {shape} = attrs;\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape =  
util.inferFromImplicitShape(shape, xSize);\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () =>  
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n    `shape must have the same number of  
elements.`);\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as { } as KernelFunc\n};\n\n"/**\n *
```

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=====\n*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from\n './Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,\n  null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(`\n      BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ?\n    a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -\n    1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA =\n    util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const\n    batchDimsCompatible =\n    batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n    aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n    () => `Error in matMul: the input\n    batch dimensions must either be the\n    ` +\n    `same or at least one input batch dimension must be 1. Got input\n    ` +\n    `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n    batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =\n    outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n    innerShapeA === innerShapeB,\n    () => `Error in matMul: inner shapes (${innerShapeA}) and\n    ` +\n    `${innerShapeB} of Tensors with shapes\n    ${a.shape} and\n    ` +\n    `${b.shape} and transposeA=${transposeA}` +\n    ` and transposeB=${transposeB}\n    must match.`);\n\n    const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n    [batchDimA, outerShapeA, innerShapeA];\n    const b3dShape = transposeB ? [batchDimB, outerShapeB,\n    innerShapeB] :\n    [batchDimB, innerShapeB, outerShapeB];\n\n    // The rest of the\n    implementation is designed to operate on rank-3 tensors\n    const a3d = reshape({inputs: {x: a}, backend, attrs:\n    {shape: a3dShape}});\n    const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n    const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n    const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n    const leftDim =\n    transposeA ? a3d.shape[2] : a3d.shape[1];\n    const rightDim =\n    transposeB ? b3d.shape[1] : b3d.shape[2];\n    const batchDim = Math.max(batchDimA, batchDimB);\n\n    const out = backend.makeOutput([batchDim, leftDim,\n    rightDim], a3d.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new\n    Uint8Array(new Int32Array(a3d.shape).buffer);\n    const bShapeBytes = new Uint8Array(new\n    Int32Array(b3d.shape).buffer);\n\n    wasmBatchMatMul(\n    a3dId, aShapeBytes, a3d.shape.length, b3dId,\n    bShapeBytes,\n    b3d.shape.length, transposeA, transposeB, outId);\n\n    backend.disposeData(a3d.dataId);\n    backend.disposeData(b3d.dataId);\n\n    out.shape = outShape;\n    return out;\n  }\n\n  export const batchMatMulConfig:\n  KernelConfig = {\n    kernelName: BatchMatMul,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    batchMatMul as {} as KernelFunc\n  };\n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
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KTtcbiAgfVxuXG4gIGmIChkdHlwZSA9PT0gJ3N0cmluZycpIHtcbiAgICByZXRlcm4gYmFja2VuZF91dGlsLm
Zyb21TdHJpbnmBcnJheVRvVWludDgob3V0QnVmLnZhbHVlcYBhcyBzdHJpbnmBxSsk7XG4gIH1cbiAgcmV0d
XJuIG91dEJlZi52YWx1ZXMGYXMGVHlwZWRBcnJheTtcbn1cblxuZXhwb3J0IGZlbnN0aW9uIHNsaWNiKfXu
ICAgIGFyZ3M6IHtpbnB1dHM6IFNsaWNISW5wdXRzLCBiYWNRZlZW5kOjBNYXR0QmFja2VuZENQVSwgYX
R0cnM6IFNsaWNiQXR0cnN9KTpcbiAgICBUZlZW5zb3JJbmZvIHtcbiAgY29uc3Qge2lucHV0cywgYmFja2VuZC
wgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBjb25zdCB7YmVnaW4sIHNpemV9ID
0gYXR0cnM7XG5cbiAgYXNZZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcbxuICBjb25zdCBbJGJlZ2luLCAk
c2l6ZlV0gPSBzbGljZlV91dGlsLnBhcnNIU2xpY2VQYXJhbXMOeCwgYmVnaW4sIHNpemUpO1xuICBzbGljZlV9
1dGlsLmFzc2VydFBhcmFtc1ZhbGlkKHgsICRiZWdpciWgJHNpemUpO1xuXG4gIGNvbN0IHZhbHMgPSBiYW
NRZlZW5kLmRhdGEuZ2V0KHguZGF0YUlkKS52YWx1ZXM7XG4gIGNvbN0IG91dFZhbHMgPSBzbGljZUlucG
wodmFscywgJGJlZ2luLCAk2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNRZlZW5kLm1ha2
VUZW5zb3JJbmZvKCRzaXplLCB4LmR0eXBILCBvdXRWYWxzKTtcbn1cblxuZXhwb3J0IGNvbN0IHNSaWN
IQ29uZmlnOiBLZXJuZlZlZ2lmaW5kPSB7XG4gIGtcm5lbE5hbWU6IFNsaWNILF0uICBiYWNRZlZW5kTmFtZ
TogJ2NwdScsXG4gIGtcm5lbEZ1bmM6IHNsaWNiIGFzIHt9IGFzIETcm5lbEZ1bmNcbn07XG4iXX0=","/*\n *
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=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}  
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {sliceImplCPU} from  
 './kernel_utils/shared';\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:  
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n  const [begin_, size_] =  
slice_util.parseSliceParams(x, begin, size);\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,  
size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const  
xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n  if (isContinuous)  
{\n  const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n  if (x.dtype === 'string') {\n  outData.stringBytes =\n    (xVals as Uint8Array[]).slice(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  } else {\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(\n    (xVals as TypedArray).subarray(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  });\n  return out;\n  }\n  if (x.dtype === 'string') {\n  const res =  
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n  outData.stringBytes = res as Uint8Array[];\n  return  
out;\n  }\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2)  
{\n  slice2d(\n    xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n    size_ as [number, number]);\n  } else if (rank === 3) {\n  slice3d(\n    xVals as TypedArray, xStrides[0], xStrides[1],  
outVals,\n    begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4)  
{\n  slice4d(\n    xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n    begin_ as [number, number, number, number],\n    size_ as [number, number, number, number]);\n  } else {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n  outVals.set(res);\n  }\n  return  
out;\n  }\n  \nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:  
backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;  
i++) {\n  const xOffset = i * xStride + beginJ;\n  outVals.set(xVals.subarray(xOffset, xOffset + size[1]),  
outOffset);\n  outOffset += size[1];\n  }\n  }\n  \nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:  
number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size:  
[number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n
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const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <\n endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3: number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number, number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n }\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction batchToSpaceND(\n args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockShape, crops } = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n const xTransposed = transpose({ inputs: { x: xReshaped }, backend, attrs: { perm: permuted } });\n const xTransposedReshaped = reshape({ inputs: { x: xTransposed }, backend, attrs: { shape: reshapedPermuted } });\n const result = slice({ inputs: { x: xTransposedReshaped }, backend, attrs: { begin: sliceBeginCoords, size: sliceSize } });\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n }\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nexport function cast(\n args: {\n inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm\n}) {\n TensorInfo {\n const { inputs: { x }, attrs: { dtype }, backend } = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
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backend.tensorArrayFromHeap(x);\n const outVals = backend.tensorArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =\n    backend.wasm.cwrap(ClipByValue, null /* void */, [\n      'number', // x_id\n      'number', // min\n      'number', //\n      max\n      'number' // out_id\n    ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend:\n      BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n      backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId,\n      clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as\n      KernelFunc\n  }; \n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { KernelConfig, Ceil } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n '../unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { concatImplCPU } from\n '../kernel_utils/shared';\nimport { identity } from './Identity';\nimport { reshape } from './Reshape';\n\nexport function\n  concat(\n    args: {\n      inputs: ConcatInputs,\n      backend: BackendWasm,\n      attrs: ConcatAttrs\n    }) {\n    const {inputs, backend}\n    = args;\n    const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n    let outShape =\n      backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n    // Keep only non-empty tensors (ignore tensors\n    with 0 in their shape).\n    const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n    if ($inputs.length ===\n    1) {\n      return identity({inputs: {x: $inputs[0]}, backend});\n    }\n    const out = backend.makeOutput(outShape,\n      inputs[0].dtype);\n    if (util.sizeFromShape(outShape) === 0) {\n      return out;\n    }\n    const shapes =\n      $inputs.map(t => t.shape);\n    backend_util.assertParamsConsistent(shapes, axis);\n    if ($inputs[0].dtype ===\n    'string') {\n      // Any concat of n-dimensional tensors across any axis can be reduced to\n      // a concatenation of two-
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function conv2d(\n    args: { inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs }) {\n    const { inputs, attrs, backend } = args;\n    const { x, filter } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const { strides, dilations, pad, dimRoundingMode, dataFormat } = attrs;\n    const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false, $dataFormat);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels = convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend Conv2D does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n    }\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n    return out;\n  }\n\n  export const conv2DConfig: KernelConfig = {\n    kernelName: Conv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2d as { } as KernelFunc\n  }; \n}\n\n/*\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
```



```

extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n  'number', // imagesId\n
'number', // boxesId\n  'number', // boxIndId\n  'number', // numBoxes\n  'array', // images shape\n  'number', // cropHeight\n  'number', // cropWidth\n  'number', // method\n  'number', // extrapolation value\n  'number' // out id\n ]);\n\nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n  attrs: CropAndResizeAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {method, extrapolationValue, cropSize} = attrs;\n  const {image, boxes, boxInd} = inputs;\n  const numBoxes = boxes.shape[0];\n  const [cropHeight, cropWidth] = cropSize as [number, number];\n  const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n  let imagesData = backend.dataIdMap.get(image.dataId);\n  let castedData;\n  if (image.dtype !== 'float32') {\n    castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n    imagesData = backend.dataIdMap.get(castedData.dataId);\n  }\n  const imagesId = imagesData.id;\n  const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n  const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n  const out = backend.makeOutput(outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n  const wasmCropAndResize = (\n    imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n    cropWidth,\n    InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n    extrapolationValue, outId);\n  if (castedData !== null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n  kernelName: CropAndResize,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nimport {transpose} from './Transpose';\nlet wasmCumsum: (xId: number, exclusive: number, reverse:

```



```

const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n  xId, blockSize, channelsLast,\n  xStridesBytes, x.shape.length - 1,\n  outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return\n out);\n\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:\n  'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\n  DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport\n {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,\n  inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:\n  number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:\n  number, dilationWidth: number, strideHeight: number, strideWidth: number, inputChannels: number,\n  outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n  backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n    'number', /\n    xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', //\n    filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', //\n    padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', /\n    dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function\n  depthwiseConv2d(args: {\n    inputs: DepthwiseConv2dNativeInputs,\n    backend: BackendWasm,\n    attrs:\n    DepthwiseConv2dNativeAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n\n    const {x, filter} = inputs;\n    const\n    xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    const\n    {strides, dilations, pad, dimRoundingMode} = attrs;\n\n    const $dilations = dilations == null ? [1, 1] : dilations;\n\n    const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,\n    strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop =\n    convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =\n    convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =\n    convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels =\n    convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n    if\n    (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n      `wasm backend DepthwiseConv2dNative\n      does not support dataFormat: ` +\n      ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n    }\n\n    const out =\n    backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmDepthwiseConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n    filterWidth,\n    padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight, dilationWidth, strideHeight, strideWidth,\n    inputChannels,\n    outputChannels, outId);\n\n    return out;\n  }\n\n  export const depthwiseConv2dNativeConfig:\n  KernelConfig = {\n    kernelName: DepthwiseConv2dNative,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: depthwiseConv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n\n*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n", "/*\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from\n './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =\n attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if\n (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${inputRank}]`);\n $dim = inputRank + dim\n + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:\n newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs:
 FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out =
 backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as
 number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName:
 'wasm',\n  kernelFunc: fill as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n *
 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

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*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch:
 number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>
 void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
 null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', //
 imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n
 args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n
  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId =
 backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch,
 imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch,
 imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:
 KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as { } as
 KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
 compliance with the License.\n * You may obtain a copy of the License at\n *
 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

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*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
 TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet
 wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,
 varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number',
 'number', 'number', 'number', 'number'];\n  );\n}\n\nfunction fusedBatchNorm(args: {\n  backend:
 BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const
 {backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} =
 inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =
 backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const
 offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ?
 backend.dataIdMap.get(scale.dataId).id : 0;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-
circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n  const outId =
 backend.dataIdMap.get(out.dataId).id;\n  wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId,
 varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName:

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FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====\n*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version  
 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
 copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable  
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
 the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google  
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not  
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
 software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,  
 Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport  
 {FusableActivation} from './types';\nlet wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight:  
 number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,  
 padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,  
 dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,  
 leakyreluAlpha: number, outId: number) =>\n void;\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //  
 batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //  
 filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //  
 inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //  
 preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\nfunction  
 fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})  
 {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =  
 attrs;\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as  
 Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n const fusedActivation =\n
```

```

FusableActivation[activation as { } as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n  throw
new Error(\n    `${activation} activation not yet supported for FusedConv2D` +\n    `in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n  const biasData = backend.dataIdMap.get(bias.dataId);\n  if (biasData.shape.length !== 1) {\n
throw new Error(\n    `FusedConv2D only supports rank-1 bias but got` +\n    `rank
${biasData.shape.length}`);\n  }\n  if (biasData.shape[0] !== outputChannels) {\n  throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not` +\n    `match the number of output channels
(${outputChannels})`);\n  }\n  biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n  throw new Error(\n    `wasm backend FusedConv2D does not support
dataFormat:` +\n    `${dataFormat}`. Please use 'NHWC'.);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n  0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n  xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n  fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n  kernelName: FusedConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc:
fusedConv2d as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmfusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmfusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n}\n\nfunction

```

```

fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {}
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `_${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}`);\n }\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat: ` +\n `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n
'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n
'number', // sliceSize\n 'array', // strides\n 'number' // outId\n ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}): TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return

```

```

out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,
outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd};\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from
'./backend_wasm';\nimport { reshape } from './Reshape';\nimport { CppDType } from './types';\n\nlet wasmGather:
(\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize:
number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array',
// xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', //
outStrides\n 'number' // outId\n ]);\n}\n\nfunction gatherV2(\n args: { backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { x,
indices } = inputs;\n const { axis, batchDims } = attrs;\n\n // Throw error when any index is out of bound.\n const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index
= indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n const flattenX = reshape({\n inputs: { x },\n attrs: {\n shape: [\n shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: { x: indices },\n
attrs: {\n shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize],\n backend\n });\n const
flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n
shapeInfo.sliceSize\n ];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
* @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

```


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```
=====\n*\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>\nvoid;\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // leakyrelu_alpha\n    'number', // out_id\n  ]);\n}\nexport function leakyRelu(\n  args: {\n    inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm\n  }):\n  TensorInfo {\n  const { inputs: { x }, attrs: { alpha }, backend } = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  // According to TF API, LeakyRelu returns float32 when input is either float32\n  // or int32.\n  const out = backend.makeOutput(x.shape, 'float32');\n  if (util.sizeFromShape(x.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n  }\n  return out;\n}\nexport const leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: leakyRelu as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n  createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\nvoid;\nfunction setup(backend: BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n
```

```

'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n ]);\n\nfunction max(args: {backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId =
transposedId;\n };\n\n const inputRank = input.shape.length;\n   backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n   const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n   const reduceSize =
util.sizeFromShape(reduceShape);\n\n   const out = backend.makeOutput(outShape, x.dtype);\n   if
(util.sizeFromShape(input.shape) !== 0) {\n     const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n   }\n\n   if (inputWasTransposed) {\n     // dispose of the
transposed tensor.\n     backend.disposeData(transposed.dataId);\n   }\n\n   if (keepDims) {\n     // reshape\n     const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n     out.shape = newShape;\n   }\n\n   return out;\n }\n\nexport const maxConfig: KernelConfig = {\n   kernelName: Max,\n   backendName: 'wasm',\n   setupFunc: setup,\n   kernelFunc: max as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
\n\n=====\n\n*/\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\ncreateBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
\n\n=====\n\n*/\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
\n\n=====\n\n*/\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n\n"/**\n * @license\n *
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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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```

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```
=====\n*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}\nfrom '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmMaxPool: (\n  xId:\n  number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:\n  number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:\n  number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =\n  backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', //\n    inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', //\n    padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //\n    dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //\n    // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\nfunction maxPool(\n  args:\n  {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =\n  args;\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  // TF API\n  supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it\n  because it uses xnpack which only\n  // supports float32.\n  // Add the following assert only for the WASM\n  backend instead of at core op\n  // level.\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype\n    === 'float32',\n    () =>\n    `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n  const\n  {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n  const filterHeight =\n  convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const\n  padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =\n  convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =\n  convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =\n  convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =\n  convInfo.outChannels;\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm\n      backend does not support dataFormat:` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =\n  backend.dataIdMap.get(out.dataId).id;\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],\n    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n    strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\nexport const maxPoolConfig:\nKernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool\n} as KernelFunc;\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
```

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```
=====  
*import {KernelConfig, Maximum} from '@tensorflow/tfjs-core';  
import {createBinaryKernelConfig} from './binary_kernel';  
const supportsFullBroadcast = false;  
export const maximumConfig: KernelConfig =  
createBinaryKernelConfig(Maximum, supportsFullBroadcast);  
"/**  
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 * permissions and limitations under the License.  
 */  
=====  
import {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';  
import {BackendWasm} from './backend_wasm';  
import {cast} from './Cast';  
import {permuteAxesAndTranspose} from './kernel_utils';  
let wasmMean: (xId: number, reduceSize: number, outId: number) => void;  
function setup(backend: BackendWasm): void {  
  wasmMean = backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);  
  export function mean({backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}: TensorInfo, {axis, keepDims} = attrs, {x} = inputs, {xId = backend.dataIdMap.get(x.dataId).id, let inputId = xId, let input = x, const {transposed, axes, originalAxes, inputWasTransposed} = permuteAxesAndTranspose(x, axis, backend); let reductionAxes = axes; if (inputWasTransposed) { const transposedId = backend.dataIdMap.get(transposed.dataId).id; if (transposedId !== xId) { // transpose was not a no-op. We will need to dispose of this // once we are done. input = transposed; inputId = transposedId; reductionAxes = backend_util.getInnerMostAxes(reductionAxes.length, input.shape.length); } } backend_util.assertAxesAreInnerMostDims('mean', reductionAxes, input.shape.length); const [outShape, reduceShape] = backend_util.computeOutAndReduceShapes(input.shape, reductionAxes); const reduceSize = util.sizeFromShape(reduceShape); let castedInput = input; if (input.dtype !== 'float32') { castedInput = cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}}); inputId = backend.dataIdMap.get(castedInput.dataId).id; } const out = backend.makeOutput(outShape, 'float32'); if (util.sizeFromShape(input.shape) !== 0) { const outId = backend.dataIdMap.get(out.dataId).id; wasmMean(inputId, reduceSize, outId); } if (inputWasTransposed) { // dispose of the transposed tensor. backend.disposeData(transposed.dataId); } if (keepDims) { // reshape const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes); out.shape = newShape; } if (input.dtype !== 'float32') { backend.disposeData(castedInput.dataId); } return out; }  
export const meanConfig: KernelConfig = {  
  kernelName: Mean,  
  backendName: 'wasm',  
  setupFunc: setup,  
  kernelFunc: mean as KernelFunc  
};  
"/**  
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 * implied. See the License for the specific language governing permissions and  
 * limitations under the License.  
 */  
=====  
import {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
```

```
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n  'number', // x_id\n
'number', // dtype\n  'number', // reduce_size\n  'number', // out_id\n  ]);\n\n  function min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n    inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We
will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n      }\n
}\n\n    const inputRank = input.shape.length;\n\n    backend_util.assertAxesAreInnerMostDims('min', axes,\n
inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape,\n
axes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape,\n
input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId =
backend.dataIdMap.get(out.dataId).id;\n      wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n    }\n\n    if
(inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n
}\n\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape,\n
originalAxes);\n      out.shape = newShape;\n    }\n\n    return out;\n  }\n\n  export const minConfig: KernelConfig = {\n
kernelName: Min,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: min as {} as\n  KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *\n
=====\n\n*\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // x.dtype\n  'array', // pre-
paddings\n  'array', // post-paddings\n  'number', // mode\n  'number', // outId\n  ]);\n\n  function
mirrorPad(args: {\n  inputs: MirrorPadInputs,\n  backend: BackendWasm,\n  attrs: MirrorPadAttrs\n}) {\n  const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n  const outShape = paddings.map(\n    (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(outShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const
postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n  postPaddingsBytes,\n
MirrorPaddingMode[mode], outId);\n  return out;\n}\n\n  export const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as {} as KernelFunc,\n  setupFunc:
setup\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
```

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```
=====  
* \nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====  
*\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\nNonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\nlet wasmFunc: (\nboxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)\n=> number;\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\nNonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,\n maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n const boxesId =\nbackend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n const\nresOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n const\n{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n// Since we are not using scores for V3, we have to delete it from the heap.\nbackend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n const selectedIndicesTensor\n=\n backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n return\nselectedIndicesTensor;\n}\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:\nNonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {\nKernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====  
*\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\ncreateBinaryKernelConfig(Multiply, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
```

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```
=====  
* \nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core'; \nimport { createUnaryKernelConfig } from  
'./unary_kernel'; \nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg); \n", /*  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for  
the specific language governing permissions and \n * limitations under the License. \n *  
=====
```

```
=====  
* \nimport { BackendWasm } from './backend_wasm'; \n\n// Analogous to `struct Result` in  
`non_max_suppression_impl.h`. \ninterface Result { \n  pSelectedIndices: number; \n  selectedSize: number; \n  pSelectedScores: number; \n  pValidOutputs: number; \n} \n\n * Parse the result of the c++ method, which has the  
shape equivalent to `Result`. \n * \nexport function parseResultStruct( \n  backend: BackendWasm, resOffset:  
number): Result { \n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4); \n  const  
pSelectedIndices = result[0]; \n  const selectedSize = result[1]; \n  const pSelectedScores = result[2]; \n  const  
pValidOutputs = result[3]; \n  // Since the result was allocated on the heap, we have to delete it. \n  
backend.wasm._free(resOffset); \n  return { pSelectedIndices, selectedSize, pSelectedScores,  
pValidOutputs }; \n} \n", /*  
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License. \n *  
=====
```

```
=====  
* \nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,  
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core'; \nimport { BackendWasm } from  
 './backend_wasm'; \nimport { parseResultStruct } from './NonMaxSuppression_util'; \n\nlet wasmFunc: ( \n  boxesId: number, scoresId: number, maxOutputSize: number, \n  iouThreshold: number, scoreThreshold: number, \n  padToMaxOutputSize: boolean) => number; \n\nfunction setup(backend: BackendWasm): void { \n  wasmFunc =  
backend.wasm.cwrap( \n  NonMaxSuppressionV4, \n  'number', // Result* \n  [ \n    'number', // boxesId \n    'number', // scoresId \n    'number', // maxOutputSize \n    'number', // iouThreshold \n    'number', //  
scoreThreshold \n    'bool', // padToMaxOutputSize \n  ] ); \n} \n\nfunction nonMaxSuppressionV4(args: { \n  backend: BackendWasm, \n  inputs: NonMaxSuppressionV4Inputs, \n  attrs: NonMaxSuppressionV4Attrs }):  
TensorInfo[] { \n  const { backend, inputs, attrs } = args; \n  const { iouThreshold, maxOutputSize, scoreThreshold,  
padToMaxOutputSize } = \n    attrs; \n  const { boxes, scores } = inputs; \n  \n  const boxesId =  
backend.dataIdMap.get(boxes.dataId).id; \n  const scoresId = backend.dataIdMap.get(scores.dataId).id; \n  \n  const  
resOffset = wasmFunc( \n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold, \n    padToMaxOutputSize ); \n  \n  const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } = \n    parseResultStruct(backend, resOffset); \n  \n  // Since we are not using scores for V4, we have to delete it from the  
heap. \n  backend.wasm._free(pSelectedScores); \n  \n  const selectedIndicesTensor = \n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices); \n  \n  const validOutputsTensor =  
backend.makeOutput([], 'int32', pValidOutputs); \n  \n  return [selectedIndicesTensor,
```

```
validOutputsTensor];\n)\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n  kernelName:
NonMaxSuppressionV4,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n *
```

```
=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n  number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n
      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //
scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend:
BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[]
{\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma }
= attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const { pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using
validOutputs for V5, we have to delete it from the\n    // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const
selectedIndicesTensor =\n      backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n    const
selectedScoresTensor =\n      backend.makeOutput([selectedSize, 'float32', pSelectedScores);\n\n    return
[selectedIndicesTensor, selectedScoresTensor];\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =
{\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc
as { } as KernelFunc,\n  };,\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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=====\n
*\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmOneHot: (\n  indicesId: number, depth:
number, onValue: number, offValue: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n
    'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n\n  function
oneHot(\n    args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {\n    const { inputs,
backend, attrs } = args;\n    const { indices } = inputs;\n    const { depth, onValue, offValue } = attrs;\n\n    const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const
indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n    return out;\n  }\n\n  export const oneHotConfig:
KernelConfig = {\n    kernelName: OneHot,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: oneHot as
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{ } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.tensorArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\nexport const onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\nexport function pack(\n  args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {axis} = attrs;\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}};\n      );\n\n      const shape = inputs[0].shape;\n      const dtype = inputs[0].dtype;\n\n      inputs.forEach(t => {\n        util.assertShapesMatch(\n          shape, t.shape,\n          'All tensors passed to stack must have matching shapes');\n        util.assert(\n          dtype === t.dtype,\n          () => 'All tensors passed to stack must have matching dtypes');\n      });\n\n      const intermediateTensorInfos: TensorInfo[] = [];\n      const expandedTensors = inputs.map(t => {\n        const expandedT =\n          expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n        intermediateTensorInfos.push(expandedT);\n        return expandedT;\n      });\n\n      const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n      intermediateTensorInfos.forEach(t =>\n        backend.disposeData(t.dataId));\n\n      return result;\n    }\n\n    export const packConfig: KernelConfig = {\n      kernelName: Pack,\n      backendName: 'wasm',\n      kernelFunc: pack as { } as KernelFunc,\n    };\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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=====\n*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {fill} from './Fill';\nimport {CppType} from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n  const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n    return fill({\n      backend,\n      attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n    });\n  }\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const outTensorData = backend.dataIdMap.get(out.dataId);\n  const outId = outTensorData.id;\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n  wasmPadV2(\n    xId, xShapeBytes, x.shape.length,\n    CCppType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes, constantValue, outId);\n  return out;\n}\n\nexport const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as {\n    KernelFunc,\n    setupFunc: setup\n  };,\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' // out_id\n  ]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const {x, alpha} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n  let inputId = xId;\n  const input = x;\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n    inputId = backend.dataIdMap.get(castedInput.dataId).id;\n  }\n  const out = backend.makeOutput(x.shape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmPrelu(inputId, weightsId, outId);\n  if (input.dtype !== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n  return out;\n}\n\nexport const preluConfig: KernelConfig = {\n  kernelName: Prelu,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: prelu as {\n    KernelFunc\n  };,\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
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```
=====\n*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
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=====\n*\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\nlet wasmProd: (\n  xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs: ProdAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId =\n        backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length, input.shape.length);\n      }\n    }\n    backend_util.assertAxesAreInnerMostDims(\n      'prod', reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n    const out = backend.makeOutput(outShape, input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmProd(inputId, reduceSize, CCppType[out.dtype], outId);\n    }\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n    return out;\n  }\n  export const prodConfig: KernelConfig = {\n    kernelName: Prod,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prod as { } as KernelFunc\n  };\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
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=====\n*\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =
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backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', //
oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', //
newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n ]);\n\nfunction
resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}):
TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners,
halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth,
numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData =
backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n
cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData =
backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight,
oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if
(castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC.
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} =
args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n
const out = backend.makeOutput([values.length], dtype);\n const outVals =
backend.TypedArrayFromHeap(out);\n outVals.set(values);\n return out;\n};\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {util} from '@tensorflow/tfjs-core';\n\nexport function rangeImpl(start, stop, step, dtype) {\n const
sameStartStop = start === stop;\n const increasingRangeNegativeStep = start < stop && step < 0;\n const
decreasingRangePositiveStep = stop < start && step > 1;\n if (sameStartStop || increasingRangeNegativeStep ||\n
decreasingRangePositiveStep) {\n return util.makeZerosTypedArray(0, dtype);\n }\n const numElements
= Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n
if (stop < start && step === 1) {\n // Auto adjust the step's sign if it hasn't been set\n // (or was set to 1)\n
step = -1;\n }\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n values[i] = values[i - 1] +
step;\n }\n return values;\n}\n\n#
sourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiaU9uZmFuZ2VfaW1wbC5qcyIsInVudXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL2tlc

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=====\n*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\ncreateBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array, outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number', // out_id\n  ]);\n\n  export function reverse(\n    args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n    TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} = attrs;\n    const axes = util.parseAxisParam(dims, x.shape);\n    if (x.shape.length === 0) {\n      return identity({inputs: {x}, backend});\n    }\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    wasmReverse(xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n  export const reverseConfig: KernelConfig = {\n    kernelName: Reverse,\n    backendName: 'wasm',\n    kernelFunc: reverse as {} as KernelFunc,\n    setupFunc: setup\n  }; \n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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=====  
*  
\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n  fillBytes: Uint8Array, fillLength: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n    'number', // outId\n  ]);\n  export function rotateWithOffset(args: {\n    inputs: RotateWithOffsetInputs,\n    backend: BackendWasm,\n    attrs: RotateWithOffsetAttrs\n  }): TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {image} = inputs;\n    const {radians, fillValue, center} = attrs;\n    const out = backend.makeOutput(image.shape, image.dtype);\n    const imageId = backend.dataIdMap.get(image.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n    const [centerX, centerY] = backend_util.getImageCenter(center, imageHeight, imageWidth);\n    const fillIsBlack = fillValue === 0;\n    const fullOpacityValue = 255;\n    const fillValues = typeof fillValue === 'number' ? [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] : [...fillValue, fullOpacityValue];\n    const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n    wasmRotate(\n      imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n      centerY, fillBytes, fillValues.length, outId);\n    return out;\n  }\n  export const rotateWithOffsetConfig: KernelConfig = {\n    kernelName: RotateWithOffset,\n    backendName: 'wasm',\n    kernelFunc: rotateWithOffset as {} as KernelFunc,\n    setupFunc: setup\n  };  
}"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

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=====  
*  
\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CCppType, sliceRank: number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', // sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs\n    }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices, updates} = inputs;\n    const {shape} = attrs;\n    const out = backend.makeOutput(shape, updates.dtype);\n    if (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n    const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n    const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n    const updatesData =
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backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
  Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmScatterNd(\n   indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n   sliceSize,
  stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n
  kernelName: ScatterNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: scatterNd as {} as
  KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the
  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *

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=====\n
*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
  './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
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  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
  './unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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  law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\nimport
  {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
  offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
  backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n    'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: {inputs: SelectInputs, backend:
  BackendWasm}) {\n    const {inputs, backend} = args;\n    const {condition, t, e} = inputs;\n    const conditionId =
  backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId =
  backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId =
  backend.dataIdMap.get(out.dataId).id;\n    const cRank = condition.shape.length;\n    const tRank =
  t.shape.length;\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1:\n    util.sizeFromShape(t.shape.slice(1));\n\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export
  const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as {}
  as KernelFunc,\n    setupFunc: setup\n  };\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
  Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
  except in compliance with the License.\n * You may obtain a copy of the License at\n *
  http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\nTensorInfo {\n  const { backend, inputs: { x } } = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId);\n  return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n    'number', // xId\n    'number', // outId\n    'number', // channels\n    'number' // batch\n  ]);\n}\n\nfunction softmax(\n  args: { backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\nTensorInfo {\n  const { backend, inputs: { logits }, attrs: { dim } } = args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape, logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n  const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
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```
=====\n*\n\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
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SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from
 './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction
spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:
SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,
paddings} = attrs;\n\n  const prod = util.sizeFromShape(blockShape);\n\n  const completePaddings: Array<[number,
number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n\n  for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n\n  const paddedX =
padV2Config.kernelFunc({\n    inputs: {x},\n    backend,\n    attrs: {paddings: completePaddings, constantValue:
0}\n  }) as TensorInfo;\n\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
reshapedPaddedShape.length, blockShape.length, false);\n\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n  const reshapeInputs:
ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const
paddedXReshaped =\n    reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n  const transposeInputs:
TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n    TransposeAttrs = {perm:
permutedReshapedPaddedPermutation};\n  const paddedXT =\n    transpose({inputs: transposeInputs, backend,
attrs: transposeAttrs});\n\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const
resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n  const result = reshape(\n    {inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n  backend.disposeData(paddedX.dataId);\n
backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n\n  return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
 '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n  args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n  const
{numOrSizeSplits, axis} = attrs;\n\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n
return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:
'wasm',\n  kernelFunc: splitV as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-

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core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n  'number', // x_id\n  'number', // alpha\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction step(\n  args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {alpha} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmStep(xId,
alpha, CppDType[x.dtype], outId);\n  return out;\n}\n\nexport const stepConfig: KernelConfig = {\n  kernelName:
Step,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: step as {} as KernelFunc\n};\n\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n\n", "/*\n *
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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig}
from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const squaredDifferenceConfig: KernelConfig
=\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n\n", "/*\n *
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2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'/Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:

```

```

Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
  'number', // xId\n  'array', // xStrides\n  'number', // xRank\n  'array', // beginBytes\n  'array', // endBytes\n  'array', // stridesBytes\n  'array', // outShapeBytes\n  'array', // outStridesBytes\n  'number', //
  outShapeLength\n  'number', // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n  inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n    sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n\n  let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},\n      backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
    memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
    rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n    // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},\n      backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:\n      finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
    backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const
    xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes
    = new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new
    Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n    const
    outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =
    new Uint8Array(\n      new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
    backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length,\n      beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n    result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n    backend.disposeData(out.dataId);\n
  }\n\n  return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as {} as KernelFunc\n};\n"}\n"/**\n *
  @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
  2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
  copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
  *\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
  '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
  {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
  number, reduceSize: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
  BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n  'number', // input_id\n  'number', // reduce_size\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction sum(args: {backend:
  BackendWasm, inputs: SumInputs, attrs: SumAttrs}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const
  {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let
  inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const
  transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was
  not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =
  transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length,

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input.shape.length);\n  }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n  'sum', reductionAxes,
input.shape.length);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\\n
*\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n
createBinaryKernelConfig(Sub, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\\n
*\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTile: (n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //
x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n
  ]);\n}\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n    CppDType[out.dtype], outId);\n  return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number',
// x.shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n  wasmTopK(\n    xId, xShapeBytes, x.shape.length,\n
CppType[x.dtype], k, sorted,\n    outValuesId, outIndicesId);\n\n  return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: topk as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmTransform: (\n  imageId:
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)

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=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,\n  null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n}\n\nfunction transform(\n  args:\n    { backend: BackendWasm, inputs: TransformInputs, attrs:\n      TransformAttrs }):\n  TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { image, transforms } = inputs;\n    const { interpolation, fillMode, fillValue, outputShape } = attrs;\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n    const [outHeight, outWidth] =\n      outputShape != null ? outputShape :\n      [imageHeight, imageWidth];\n    const outShape =\n      [batch, outHeight, outWidth,\n        numChannels] as\n      [number, number, number, number];\n    const strides =\n      new Uint8Array(new\n      Int32Array(util.computeStrides(image.shape)).buffer);\n\n    const out = backend.makeOutput(outShape,\n      image.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const imageData =\n      backend.dataIdMap.get(image.dataId);\n    const imageId = imageData.id;\n\n    const transformsData =\n      backend.dataIdMap.get(transforms.dataId);\n    const transformsId = transformsData.id;\n\n    const\n      interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n    let fillModeId;\n    switch (fillMode) {\n      case 'constant':\n        fillModeId = 1;\n        break;\n      case 'reflect':\n        fillModeId = 2;\n        break;\n      case 'wrap':\n        fillModeId = 3;\n        break;\n      case 'nearest':\n        fillModeId = 4;\n        break;\n      default:\n        fillModeId = 1;\n    }\n    break;\n  }\n\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n    outWidth, numChannels, imageWidth, imageHeight, strides,\n    image.shape.length - 1, interpolationModeId,\n    fillModeId, fillValue,\n    outId);\n\n  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as {} as\n  KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

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*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from\n './Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n    const { inputs, backend, attrs } = args;\n    const { value } = inputs;\n    let { axis } = attrs;\n\n    if (axis <\n      0) {\n      axis += value.shape.length;\n    }\n\n    const numOutputs = value.shape[axis];\n    const rank =\n      value.shape.length;\n    const outShape: number[] = new Array(rank - 1);\n    let outIndex = 0;\n    for (let i = 0; i < rank;\n      i++) {\n      if (i !== axis) {\n        outShape[outIndex++] = value.shape[i];\n      }\n    }\n\n    const outs: TensorInfo[] = new\n      Array(numOutputs);\n    const begin = new Array(rank).fill(0);\n    const size = value.shape.slice();\n    size[axis] = 1;\n    for (let i = 0; i < outs.length; i++) {\n      begin[axis] = i;\n      outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },\n        backend});\n    }\n\n    return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n  }\n\n  export const\n    unpackConfig: KernelConfig = {\n      kernelName: Unpack,\n      backendName: 'wasm',\n      kernelFunc: unpack as {} as\n      KernelFunc\n    };\n\n  "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

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=====\\n *\\n//
We explicitly import the modular kernels so they get registered in the\\n// global registry when we compile the
library. A modular build would replace\\n// the contents of this file and import only the kernels that are
needed.\\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\\nimport {fusedMatMulConfig}
from './kernels/_FusedMatMul';\\nimport {absConfig} from './kernels/Abs';\\nimport {addConfig} from
 './kernels/Add';\\nimport {addNConfig} from './kernels/AddN';\\nimport {allConfig} from './kernels/All';\\nimport
{anyConfig} from './kernels/Any';\\nimport {argMaxConfig} from './kernels/ArgMax';\\nimport {avgPoolConfig}
from './kernels/AvgPool';\\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\\nimport {castConfig} from './kernels/Cast';\\nimport
{ceilConfig} from './kernels/Ceil';\\nimport {clipByValueConfig} from './kernels/ClipByValue';\\nimport
{concatConfig} from './kernels/Concat';\\nimport {conv2DConfig} from './kernels/Conv2D';\\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\\nimport {cosConfig} from
 './kernels/Cos';\\nimport {coshConfig} from './kernels/Cosh';\\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\\nimport {cumsumConfig} from './kernels/Cumsum';\\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\\nimport {eluConfig} from './kernels/Elu';\\nimport {equalConfig} from
 './kernels/Equal';\\nimport {expConfig} from './kernels/Exp';\\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\\nimport {fillConfig} from './kernels/Fill';\\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\\nimport {floorConfig} from './kernels/Floor';\\nimport {floorDivConfig} from
 './kernels/FloorDiv';\\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\\nimport {gatherNdConfig} from './kernels/GatherNd';\\nimport
{gatherV2Config} from './kernels/GatherV2';\\nimport {greaterConfig} from './kernels/Greater';\\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\\nimport {identityConfig} from './kernels/Identity';\\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\\nimport {lessConfig} from './kernels/Less';\\nimport
{lessEqualConfig} from './kernels/LessEqual';\\nimport {logConfig} from './kernels/Log';\\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\\nimport {maxConfig} from './kernels/Max';\\nimport
{maximumConfig} from './kernels/Maximum';\\nimport {maxPoolConfig} from './kernels/MaxPool';\\nimport
{meanConfig} from './kernels/Mean';\\nimport {minConfig} from './kernels/Min';\\nimport {minimumConfig} from
 './kernels/Minimum';\\nimport {mirrorPadConfig} from './kernels/MirrorPad';\\nimport {multiplyConfig} from
 './kernels/Multiply';\\nimport {negConfig} from './kernels/Neg';\\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\\nimport {notEqualConfig} from './kernels/NotEqual';\\nimport {oneHotConfig}
from './kernels/OneHot';\\nimport {onesLikeConfig} from './kernels/OnesLike';\\nimport {packConfig} from
 './kernels/Pack';\\nimport {padV2Config} from './kernels/PadV2';\\nimport {powConfig} from
 './kernels/Pow';\\nimport {preluConfig} from './kernels/Prelu';\\nimport {prodConfig} from './kernels/Prod';\\nimport
{rangeConfig} from './kernels/Range';\\nimport {realDivConfig} from './kernels/RealDiv';\\nimport {reluConfig}
from './kernels/Relu';\\nimport {relu6Config} from './kernels/Relu6';\\nimport {reshapeConfig} from
 './kernels/Reshape';\\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\\nimport {reverseConfig} from
 './kernels/Reverse';\\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\\nimport {roundConfig}
from './kernels/Round';\\nimport {rsqrtConfig} from './kernels/Rsqrt';\\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\\nimport {selectConfig} from './kernels/Select';\\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\\nimport {sinConfig} from './kernels/Sin';\\nimport {sliceConfig} from './kernels/Slice';\\nimport
{softmaxConfig} from './kernels/Softmax';\\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\\nimport {splitVConfig} from './kernels/SplitV';\\nimport {sqrtConfig} from
 './kernels/Sqrt';\\nimport {squareConfig} from './kernels/Square';\\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\\nimport {stepConfig} from './kernels/Step';\\nimport {stridedSliceConfig} from

```



```

./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n"}\n\n*
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

=====\n
*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
  const outVals = backendtypedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n"}\n\n* @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

=====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n**\n * True if SIMD is supported.\n
*\n\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n  // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n  // code. In this case it is a small program that
contains SIMD\n  // instructions.\n  'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
  Uint8Array([\n    0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n    2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,

```

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11\n  ]));\n\n/**\n * True if threads are supported.\n */\n\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag("WASM_HAS_MULTITHREAD_SUPPORT", async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n ]));\n } catch (e) {\n return false;\n }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.\/this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object\";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function\";ENVIRONMENT_IS_NODE=typeof process==="object\"&&typeof
process.versions==="object\"&&typeof
process.versions.node==="string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer\"}var scriptDirectory=\.\";function
locateFile(path){if(Module["locateFile\"]){return Module["locateFile\"}(path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"^\"}else{scriptDirectory=__dirname+\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=
nodePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\/\\/g,\"/\")}arguments_=process[\"arg

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v\].slice(2);process["on"](\("uncaughtException",function(ex){if(!ex instanceof ExitStatus)){throw
ex}});process["on"](\("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\("worker_threads"))}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?);throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=="undefined"&&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\("blob:\")!=="0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\("^")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\("fs");if(!nodePath)nodePath=require(\("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require(\("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"]arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"]wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort(\("no native wasm
support detected"))}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\("Assertion failed: "+text))}function getCFunc(ident){var
func=Module["_" + ident];assert(func,\("Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\("string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var

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len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAt(++i)&1023);if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new
Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new
Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new
Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new
Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module[\"wasmMemory\"]};buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=
Module[\"wasmMemory\"]}else{wasmMemory=new
WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not

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have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject})})}}return Promise.resolve().then(function(){return

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getBinary(wasmBinaryFile)})function createWasm(){ var info={"a":asmLibraryArg};function
receiveInstance(instance,module){ var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIROMENT_IS_PTHREAD){ var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency("\wasm-
instantiate\");}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("\wasm-instantiate\");}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"]);}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err("\failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function\&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function\){return fetch(wasmBinaryFile,{credentials:\same-
origin\}).then(function(response){ var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\wasm streaming compile failed: "+reason);err("\falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm\"])try{ var
exports=Module["instantiateWasm"](info,receiveInstance);return exports }catch(e){err("\Module.instantiateWasm
callback failed with error: "+e);return false }}instantiateAsync().catch(Promise.reject);return{ }}var
ASM_CONSTS={10520:function(){throw\Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0});};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){ var callback=callbacks.shift();if(typeof
callback===\function\){ callback(Module);continue }var func=callback.func;if(typeof
func===\number\){ if(callback.arg===undefined){ wasmTable.get(func)() }else { wasmTable.get(func)(callback.arg)
} }else { func(callback.arg===undefined?null:callback.arg) } } }var
ERRNO_CODES={ EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){ var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh

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readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\'+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){ GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)} }var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){ var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){ PThread.allocateUnusedWorker()} },initRuntime:function(){ var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);_emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb);initWorker:function(){ },t
hreadExitHandlers:[],setThreadStatus:function(){ },runExitHandlers:function(){ while(PThread.threadExitHandlers.l
ength>0){ PThread.threadExitHandlers.pop();if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors();runExitHandlersAndDeinitThread:function(tb,exitCode){ Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);_emscripten_thread_init(0,0,0)},threadExit:function(exitCode){ var
tb=_pthread_self();if(tb){ PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){ postMessage({\"cmd\": \"exit\"})} },threadCancel:function(){ PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\": \"cancelDone\"})},terminateAllThreads:function(){ for(var t in
PThread.threads){ var
pthread=PThread.threads[t];if(pthread&&pthread.worker){ PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.threads={ };for(var i=0;i<PThread.unusedWorkers.length;++i){ var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){ var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){ if(!pthread)return;if(pthread.threadInfoStruct){ var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null },returnWorkerToPool:function(worker){ PThread.runWithoutMainThreadQueuedCalls(funcio
n){ delete
PThread.threads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker

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s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined));runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[_emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[_emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=$_pthread_self()){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+' to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d["thread"]);}else
if(cmd===\"killThread\"){killThread(d["thread"]);}else
if(cmd===\"cancelThread\"){cancelThread(d["thread"]);}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d["threadId"]+\":
\'+d["text"]);}else if(cmd===\"printErr\"){err(\"Thread \"+d["threadId"]+\": \'+d["text"]);}else
if(cmd===\"alert\"){alert(\"Thread \"+d["threadId"]+\": \'+d["text"]);}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\"exitProcess\"){try{exit(d["returnCode"]);}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\'+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \'+e.filename+\":\'+e.lineno+\":
\'+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\":\"load\", \"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]|_scriptDir,\"wasmMemory\":wasmMe
memory,\"wasmModule\":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-
backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\"Assertion failed: \'+UTF8ToString(condition)+'\", at:
\'+[filename?UTF8ToString(filename):\"unknown filename\"],line,func?UTF8ToString(func):\"unknown
function\")}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof

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dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({"cmd\":"processQueuedMainThreadWork"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread\":targetThreadId,"cmd\":"processThreadQueu
e"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd\":"processThreadQueue"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret==="timed-out")return-
73;if(ret==="not-equal")return-6;if(ret==="ok")return 0;throw"Atomics.wait returned an unexpected value
"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var

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maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}},function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return

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cString}function
_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;_emsripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"";_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=\"undefined\"?document:0,typeof window!=\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emsripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)} }else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)} }function
_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ex
t[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcou
nt){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(
mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};
return 1} }function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};
ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1} }function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1} }function

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__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("\WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;ii++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="\";for(var i=0;i<count;ii++){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\undefined\|webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\object\|JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\lose_context")<0&&ext.inde
xOf("\debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;ii++){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\)\){name=name.slice(0,name.lastIndexOf("\[")});var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;ii++){var
n=name+"\["+j+"\]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\default\,\low-power\,\high-performance\];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],\depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],\antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],\p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],\preserveDrawingBuffer":!!GROWABLE_HEAP_

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I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)];var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread()
can only ever be called from main application thread!\";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal
error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread
ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={\"cmd\\\":\\\"run\\\",\"start_routine\\\":threadParams.startRoutine,\"arg\\\":threadParams.arg,\"threadInfoStruct\\\":thre
adParams.pthread_ptr,\"stackBase\\\":threadParams.stackBase,\"stackSize\\\":threadParams.stackSize};worker.runPthrea
d=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return

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6}if(!pthread_ptr){err("\pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscipten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw"Canceled!"}function
_emscipten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscipten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread")}function
__emscipten_do_pthread_join(thread,status,block){if(!thread){err("\pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err("\PThread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscipten_main_browser_thread_id()===thread){err("\Main thread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err("\pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("\Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscipten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscipten_main_thre
ad_process_queued_calls();_emscipten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emscipten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscipten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case

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49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscrip
ten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu

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le["asm"]["Q"].apply(null,arguments));var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["R"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"]["S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["T"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"]["U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["l

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"ma").apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]["qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["ua"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["za"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]["Aa"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"]["Ba"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"]["Ca"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["Da"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["Ea"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["Fa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["Ga"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["Ha"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["Ia"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"]["Ja"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"]["Ka"]).apply(null,arguments)};var

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ents});var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["La"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"]["Ma"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["Na"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"]["Oa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["Pa"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["Qa"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Ra"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Sa"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ta"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Ua"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Va"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Wa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Xa"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"]["Ya"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Za"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["_a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["g

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b\").apply(null,arguments));var
__FusedMatMul=Module[\"__FusedMatMul"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul"]=
Module[\"asm\"][\"hb\"]).apply(null,arguments));var
_malloc=Module[\"_malloc"]=function(){return(_malloc=Module[\"_malloc"]=Module[\"asm\"][\"ib\"]).apply(nul
l,arguments));var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free"]=Module[\"asm\"][\"jb\"]).apply(null,arguments
)};var
__errno_location=Module[\"__errno_location"]=function(){return(__errno_location=Module[\"__errno_locati
on\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments));var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global
_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments));var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"as
m\"][\"mb\"]).apply(null,arguments));var
__pthread_tsd_run_dtors=Module[\"__pthread_tsd_run_dtors\"]=function(){return(__pthread_tsd_run_dtors=Mod
ule[\"__pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments));var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments));var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=
function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments));var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments));var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments));var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__ems
cripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments));var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
\"][\"tb\"]).apply(null,arguments));var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments));var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments));var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscri
pten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments));var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments));var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments));var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\
\"][\"zb\"]).apply(null,arguments));var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\
\"]).apply(null,arguments));var

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__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=function(){return(__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=Module["asm\"][["Bb\"]).apply(null,arguments));var
__memalign=Module["__memalign"]=function(){return(__memalign=Module["__memalign"]=Module["asm\"][["Cb
\"]).apply(null,arguments));var
__emscripten_allow_main_runtime_queued_calls=Module["__emscripten_allow_main_runtime_queued_calls"]=1
0512;var
__emscripten_main_thread_futex=Module["__emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="\ExitStatus";this.message="\Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("\Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("\n"),1);doRun()},1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]==="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n\n);}\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =
WasmBackendModuleThreadedSimd;\n", "\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!=="undefined"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory="\n";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
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scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("\path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"\^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("\fs");if(!nodePath)nodePath=require("\path");filename=
nodePath["normalize\"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("\uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("\unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf("\blob:\")!=0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf("\^")+1)}else{scriptDirectory=""}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}else{var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"]){arguments_=Module["arguments"];}if(Module["thisProgram"]){thisProgram=
Module["thisProgram"];}if(Module["quit"]){quit_=Module["quit"];}var
wasmBinary;if(Module["wasmBinary"]){wasmBinary=Module["wasmBinary"];}var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("\no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("\Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"\Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!=null&&str!=undefined&&str!=0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var

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converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type==="number"});var numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++] =u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++] =192|u>>6;heap[outIdx++] =128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++] =224|u>>12;heap[outIdx++] =128|u>>6&63;heap[outIdx++] =128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++] =240|u>>18;heap[outIdx++] =128|u>>12&63;heap[outIdx++] =128|u>>6&63;heap[outIdx++] =128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function preRun(){if(Module["preRun"]){if(typeof Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){addOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function postMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].length){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function

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addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
dependencies"]}(runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]}(runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"]}(what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function

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emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n

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ull,arguments));var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["s"]).apply(null,arguments
)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"]["t"]).apply(null,argument
s)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"]["u"]).apply(null,ar
guments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["v"]).apply(null,arguments);
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["w"]).apply(null,argumen
ts)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["x"]).app
ly(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["y"]).a
pply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"]["z"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["A"]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module[
"asm"]["B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["C"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modu
le["_Conv2DBackpropInput"]=Module["asm"]["D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["E"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["F"]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]
=Module["asm"]["G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).a
pply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arg
uments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,argument
s)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modu
le["asm"]["N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,argu
ments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).

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apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["_asm\"][["Q"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["_asm\"][["R"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["_asm\"][["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["_asm\"][["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["_asm\"][["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["_asm\"][["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["_asm\"][["W"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["_asm\"][["X"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["_asm\"][["Y"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["_asm\"][["Z"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["_asm\"][["_"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["_asm\"][["$"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["_asm\"][["aa"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["_asm\"][["ba"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["_asm\"][["ca"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["_asm\"][["da"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["_asm\"][["ea"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["_asm\"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["_asm\"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["_asm\"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["_asm\"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["_asm\"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["_asm\"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Mod

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ule["_NonMaxSuppressionV5"]=Module["_asm"]["_la"].apply(null,arguments);var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["_asm"]["_ma"]
).apply(null,arguments);var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["_asm"]["_na"]).appl
y(null,arguments);var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["_asm"]["_oa"]).apply(nul
l,arguments);var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["_asm"]["_pa"]).apply(null,argume
nts);var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["_asm"]["_qa"]).apply(null,argu
ments);var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["_asm"]["_ra"]).apply(null,argum
ents);var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["_asm"]["_sa"]).app
ly(null,arguments);var
_ReLU=Module["_ReLU"]=function(){return(_ReLU=Module["_ReLU"]=Module["_asm"]["_ta"]).apply(null,argume
nts);var
_ReLU6=Module["_ReLU6"]=function(){return(_ReLU6=Module["_ReLU6"]=Module["_asm"]["_ua"]).apply(null,ar
guments);var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["_asm"]["_va"]).apply(null,arguments);var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["_asm"]["_wa"]).app
ly(null,arguments);var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["_asm"]["_xa"]).apply(null,arguments);var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["_asm"]["_ya"]).apply(nul
l,arguments);var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["_asm"]["_za"]).apply(null,arg
uments);var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["_asm"]["_Aa
"]).apply(null,arguments);var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["_asm"]["_Ba"]
).apply(null,arguments);var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["_asm"]["_Ca"]).ap
ply(null,arguments);var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["_asm"]["_Da"]).apply(null,arguments
);var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["_asm"]["_Ea"]).ap
ply(null,arguments);var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["_asm"]["_Fa"]).apply(null,argumen
ts);var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["_asm"]["_Ga"]).apply(n
ull,arguments);var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["_asm"]["_Ha"]).apply(null,arguments);var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["_asm"]["_Ia"]).apply(null,argume
nts);var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["_as

```

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m\"][\`Ja\"]).apply(null,arguments)};var
_Sub=Module[\`_Sub\"]=function(){return(_Sub=Module[\`_Sub\"]=Module[\`asm\"][\`Ka\"]).apply(null,arguments)};var
_Sum=Module[\`_Sum\"]=function(){return(_Sum=Module[\`_Sum\"]=Module[\`asm\"][\`La\"]).apply(null,arguments)};var
_Tan=Module[\`_Tan\"]=function(){return(_Tan=Module[\`_Tan\"]=Module[\`asm\"][\`Ma\"]).apply(null,arguments)};var
_Tanh=Module[\`_Tanh\"]=function(){return(_Tanh=Module[\`_Tanh\"]=Module[\`asm\"][\`Na\"]).apply(null,arguments)};var
_Tile=Module[\`_Tile\"]=function(){return(_Tile=Module[\`_Tile\"]=Module[\`asm\"][\`Oa\"]).apply(null,arguments)};var
_TopK=Module[\`_TopK\"]=function(){return(_TopK=Module[\`_TopK\"]=Module[\`asm\"][\`Pa\"]).apply(null,arguments)};var
_Transform=Module[\`_Transform\"]=function(){return(_Transform=Module[\`_Transform\"]=Module[\`asm\"][\`Qa\"]).apply(null,arguments)};var
_Transpose=Module[\`_Transpose\"]=function(){return(_Transpose=Module[\`_Transpose\"]=Module[\`asm\"][\`Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\`__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\`__FusedMatMul\"]=Module[\`asm\"][\`Sa\"]).apply(null,arguments)};var
_malloc=Module[\`_malloc\"]=function(){return(_malloc=Module[\`_malloc\"]=Module[\`asm\"][\`Ta\"]).apply(null,arguments)};var
_free=Module[\`_free\"]=function(){return(_free=Module[\`_free\"]=Module[\`asm\"][\`Ua\"]).apply(null,arguments)};var
___errno_location=Module[\`___errno_location\"]=function(){return(___errno_location=Module[\`___errno_location\"]=Module[\`asm\"][\`Va\"]).apply(null,arguments)};var
stackSave=Module[\`stackSave\"]=function(){return(stackSave=Module[\`stackSave\"]=Module[\`asm\"][\`Wa\"]).apply(null,arguments)};var
stackRestore=Module[\`stackRestore\"]=function(){return(stackRestore=Module[\`stackRestore\"]=Module[\`asm\"][\`Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\`stackAlloc\"]=function(){return(stackAlloc=Module[\`stackAlloc\"]=Module[\`asm\"][\`Ya\"]).apply(null,arguments)};Module[\`cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=`ExitStatus`;this.message=`Program terminated with
exit(\`+status+\`)\`;this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\`calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\`onRuntimeInitialized\"])Module[\`onRuntimeInitialized\"]();postRun(
)}if(Module[\`setStatus\"]){Module[\`setStatus\"](\`Running...\`);setTimeout(function(){setStatus(function(){Module[\`setStatus\"](\`)\`),1);doRun()},1)}else{doRun()}}Module[\`run\"]=run;if(Module[\`preInit\"]){if(typeof
Module[\`preInit\`]===\`function\`)Module[\`preInit\`]=[Module[\`preInit\`]];while(Module[\`preInit\`].length>0){
Module[\`preInit\`].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define[\'amd\'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\`WasmBackendModule\`] = WasmBackendModule;\n",`/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \`License\`);\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at*\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \`AS IS\` BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

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=====\n
*\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
 '../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount:
number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap:
DataStorage<TensorData>;\n\n  constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n    DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return
this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start =
util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n    dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n    dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n      dataId,\n      {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size *
util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n        new Uint8Array(\n          (values
as backend_util.TypedArray).buffer,\n          (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return
this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset,
dtype, shape, stringBytes} =\n    this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n
}\n    const bytes = this.wasm.HEAPU8.slice(\n      memoryOffset,\n      memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false
otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n
disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =
this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n
}\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =
this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n
const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision():
32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n
getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n
this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:
false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this
```

```

method allocates memory on the WASM heap. If `memoryOffset` is present, the memory was allocated
elsewhere (in c++) and we just record the pointer where that memory lives.
makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):
TensorInfo {
  let dataId: {};
  if (memoryOffset
== null) {
    dataId = this.write(null /* values */, shape, dtype);
  } else {
    const id =
this.dataIdNextNumber++;
    dataId = {id};
    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});
    const size = util.sizeFromShape(shape);
    this.wasm.tfjs.registerTensor(id, size,
memoryOffset);
  }
  return {dataId, shape, dtype};
}
typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):
backend_util.TypedArray {
  const buffer = this.wasm.HEAPU8.buffer;
  const
{memoryOffset} = this.dataIdMap.get(dataId);
  const size = util.sizeFromShape(shape);
  switch (dtype) {
case 'float32':
  return new Float32Array(buffer, memoryOffset, size);
case 'int32':
  return new
Int32Array(buffer, memoryOffset, size);
case 'bool':
  return new Uint8Array(buffer, memoryOffset,
size);
default:
  throw new Error(`Unknown dtype ${dtype}`);
  }
}
function
createInstantiateWasmFunc(path: string) {
  // this will be replace by rollup plugin patchWechatWebAssembly in
// miniprogram's output.
  // tslint:disable-next-line:no-any
  return (imports: any, callback: any) => {
    util.fetch(path, {credentials: 'same-origin'}).then((response) => {
      if (!response['ok']) {
        imports.env.a(`failed to load wasm binary file at '${path}'`);
      }
      response.arrayBuffer().then(binary => {
        WebAssembly.instantiate(binary, imports).then(output => {
          callback(output.instance, output.module);
        });
      });
    });
    return {};
  };
}
Returns the path of the WASM binary.
@param
simdSupported whether SIMD is supported
@param threadsSupported whether multithreading is supported
@param wasmModuleFolder the directory containing the WASM binaries.
function getPathToWasmBinary(
  simdSupported: boolean, threadsSupported: boolean,
  wasmModuleFolder: string) {
  if (wasmPath != null) {
    // If wasmPath is defined, the user has supplied a full path to
    // the vanilla .wasm binary.
    return
wasmPath;
  }
  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';
  if (simdSupported &&
threadsSupported) {
    path = 'tfjs-backend-wasm-threaded-simd.wasm';
  } else if (simdSupported) {
    path =
'tfjs-backend-wasm-simd.wasm';
  }
  if (wasmFileMap != null) {
    if (wasmFileMap[path] != null) {
      return
wasmFileMap[path];
    }
  }
  return wasmModuleFolder + path;
}
Initializes the wasm
module and creates the js <--> wasm bridge.
NOTE: We wrap the wasm module in a object with property
'wasm' instead of
returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested
in
Chrome 76).
export async function init(): Promise<{wasm: BackendWasmModule}> {
  const
[simdSupported, threadsSupported] = await Promise.all([
    env().getAsync('WASM_HAS_SIMD_SUPPORT'),
    env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')
  ]);
  return new Promise((resolve, reject) => {
    const factoryConfig: WasmFactoryConfig = {};
    /**
     * This function overrides the Emscripten
module locateFile utility.
     * @param path The relative path to the file that needs to be loaded.
     * @param
prefix The path to the main JavaScript file's directory.
     */
    factoryConfig.locateFile = (path, prefix) => {
      if (path.endsWith('.worker.js')) {
        const response = wasmWorkerContents;
        const blob = new
Blob([response], {type: 'application/javascript'});
        return URL.createObjectURL(blob);
      }
      if
(path.endsWith('.wasm')) {
        return getPathToWasmBinary(
          simdSupported as boolean,
          threadsSupported as boolean,
          wasmPathPrefix != null ? wasmPathPrefix : prefix);
      }
      return prefix
+ path;
    };
    // Use the instantiateWasm override when system fetch is not available.
    // Reference:
    // https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170
    if (customFetch) {
      factoryConfig.instantiateWasm =
createInstantiateWasmFunc(getPathToWasmBinary(
          simdSupported as boolean, threadsSupported as
boolean,
          wasmPathPrefix != null ? wasmPathPrefix : ''));
    }
    let initialized = false;
    factoryConfig.onAbort = () => {
      if (initialized) {
        // Emscripten already called console.warn so no need to
double log.
        return;
      }
      if (initAborted) {
        // Emscripten calls `onAbort` twice, resulting in double
error
        // messages.
        return;
      }
      initAborted = true;
      const rejectMsg =
'Make sure the
server can serve the `wasm` file relative to the ' +
'bundled js file. For more details see

```

```

https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers;\n
reject({message: rejectMsg});\n
};\n\n
let wasm: Promise<BackendWasmModule>;\n
// If `wasmPath` has been defined we must initialize the vanilla module.\n
if (threadsSupported && simdSupported && wasmPath === null) {\n
  factoryConfig.mainScriptUrlOrBlob = new Blob([\n
    `var WasmBackendModuleThreadedSimd = ` +\n
    `wasmFactoryThreadedSimd.toString()`,\n
    {type: 'text/javascript'}];\n
  wasm =\n
  wasmFactoryThreadedSimd(factoryConfig);\n
} else {\n
  // The wasmFactory works for both vanilla and SIMD binaries.\n
  wasm = wasmFactory(factoryConfig);\n
}\n\n
// The WASM module has been successfully created by the factory.\n
// Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n
  initialized = true;\n
  initAborted = false;\n\n
  const voidReturnType: string = null;\n
  // Using the tfjs namespace to avoid conflict with emscripten's API.\n
  module.tfjs = {\n
    init: module.cwrap('init', null, []),\n
    initWithThreadsCount: module.cwrap('init_with_threads_count', null, ['number']),\n
    getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n
    registerTensor: module.cwrap([\n
      'register_tensor', null, [\n
        'number', // id\n
        'number', // size\n
        'number', // memoryOffset\n
      ]],\n
      disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n
      dispose: module.cwrap('dispose', voidReturnType, []),\n
    };\n\n
    resolve({wasm: module});\n
  });\n
});\n\n
function typedArrayFromBuffer(buffer: ArrayBuffer, dtype: DataType):\n
backend_util.TypedArray {\n
  switch (dtype) {\n
    case 'float32':\n
      return new Float32Array(buffer);\n
    case 'int32':\n
      return new Int32Array(buffer);\n
    case 'bool':\n
      return new Uint8Array(buffer);\n
    default:\n
      throw new Error(`Unknown dtype ${dtype}`);\n
  }\n
}\n\n
const wasmBinaryNames = [\n
  'tfjs-backend-wasm.wasm',\n
  'tfjs-backend-wasm-simd.wasm',\n
  'tfjs-backend-wasm-threaded-simd.wasm'\n
] as const;\n
type WasmBinaryName = typeof wasmBinaryNames[number];\n\n
let wasmPath: string = null;\n
let wasmPathPrefix: string = null;\n
let wasmFileMap: {[key in WasmBinaryName]?: string} = {};\n
let initAborted = false;\n
let customFetch = false;\n\n
/**\n
 * @deprecated Use `setWasmPaths` instead.\n
 * Sets the path to the `.wasm` file which will be fetched when the wasm\n
 * backend is initialized. See\n
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n
 * for more details.\n
 * @param path wasm file path or url\n
 * @param usePlatformFetch optional boolean to use platform fetch to download\n
 * the wasm file, default to false.\n
 */\n
/**\n
 * @doc {heading: 'Environment', namespace: 'wasm'}\n
 */\n
export function setWasmPath(path: string, usePlatformFetch = false): void {\n
  deprecationWarn(\n
    'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n
    ' will be removed in a future release.);\n
  if (initAborted) {\n
    throw new Error(\n
      'The WASM backend was already initialized. Make sure you call ' +\n
      '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n
  }\n
  wasmPath = path;\n
  customFetch = usePlatformFetch;\n
}\n\n
/**\n
 * Configures the locations of the WASM binaries.\n
 */\n
export function setWasmPaths({\n
  * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n
  * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n
  * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n
} *);\n
tf.setBackend('wasm');\n\n
/**\n
 * @param prefixOrFileMap This can be either a string or object:\n
 * - (string) The path to the directory where the WASM binaries are located.\n
 * Note that this prefix will be used to load each binary (vanilla,\n
 * SIMD-enabled, threading-enabled, etc.).\n
 * - (object) Mapping from names of WASM binaries to custom\n
 * full paths specifying the locations of those binaries. This is useful if\n
 * your WASM binaries are not all located in the same directory, or if your\n
 * WASM binaries have been renamed.\n
 * @param usePlatformFetch optional boolean to use platform fetch to download\n
 * the wasm file, default to false.\n
 */\n
/**\n
 * @doc {heading: 'Environment', namespace: 'wasm'}\n
 */\n
export function setWasmPaths(prefixOrFileMap: string | {[key in WasmBinaryName]?: string},\n
  usePlatformFetch = false): void {\n
  if (initAborted) {\n
    throw new Error(\n
      'The WASM backend was already initialized. Make sure you call ' +\n
      '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n
      '`tf.ready()`);\n
  }\n\n
  if (typeof prefixOrFileMap === 'string') {\n
    wasmPathPrefix = prefixOrFileMap;\n
  } else {\n
    wasmFileMap = prefixOrFileMap;\n
    const missingPaths =\n
    wasmBinaryNames.filter(name => wasmFileMap[name] === null);\n
    if (missingPaths.length > 0) {\n
      throw new Error(\n
        `There were no entries found for the following binaries: ` +\n
        `${missingPaths.join(',')}`. Please either call setWasmPaths with a\n
        `map providing a path for each binary, or with a string indicating\n

```

```

`the directory where all the binaries can be found.');
```

```

}
}
customFetch = usePlatformFetch;
Used in unit tests.
*/
export function resetWasmPath(): void {
  wasmPath = null;
  wasmPathPrefix = null;
  wasmFileMap = {};
  customFetch = false;
  initAborted = false;
  let threadsCount = -1;
  let actualThreadsCount = -1;
  * Sets the number of threads that will be used by XNNPACK to create
  threadpool (default to the number of logical CPU cores).
  * This must be called before calling
  tf.setBackend('wasm').
  */
export function setThreadsCount(numThreads: number) {
  threadsCount = numThreads;
}
*/
Gets the actual threads count that is used by XNNPACK.
*/
It is set after the backend is initialized.
*/
export function getThreadsCount(): number {
  if (actualThreadsCount === -1) {
    throw new Error('WASM backend not initialized.');
```

```

}
return actualThreadsCount;
}
export const
wasmWorkerContents = `var Module={};function threadPrintErr(){var
text=Array.prototype.slice.call(arguments).join(" ");console.error(text)}function threadAlert(){var
text=Array.prototype.slice.call(arguments).join("
");postMessage({cmd:"alert",text:text,threadId:Module["_pthread_self]()})}var
err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd==="load"){Module["wasmModule"]=e.data.wa
smModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;
Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof
e.data.urlOrBlob==="string"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd==="objectTransfer"){Module["PThread"].receiveObjectTransfer(e.data)}else
if(e.data.cmd==="run"){Module["__performance_now_clock_drift"]=performance.now()-
e.data.time;Module["__emscripten_thread_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["_emscripten_tls_init"]()
);Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self
"](),1);try{var
result=Module["invokeEntryPoint"](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module["
PThread"].threadExit(result)}catch(ex){if(ex==="Canceled!"){Module["PThread"].threadCancel()}else
if(ex!="unwind"){if(ex instanceof
Module["ExitStatus"]){if(Module["getNoExitRuntime"]()){}}else{Module["PThread"].threadExit(ex.status)}}el
se{Module["PThread"].threadExit(-2);throw ex}}}}else
if(e.data.cmd==="cancel"){if(Module["_pthread_self"]()){Module["PThread"].threadCancel()}else
if(e.data.target==="setimmediate"){}}else
if(e.data.cmd==="processThreadQueue"){if(Module["_pthread_self"]()){Module["_emscripten_current_thread_
process_queued_calls"]()}else{err("worker.js received unknown command
"+e.data.cmd);err(e.data)}}catch(ex){err("worker.js onmessage() captured an uncaught exception:
"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process==="object"&&typeof
process.versions==="object"&&typeof process.versions.node==="string"){self={location:{href:__filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require("worker_threads");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on("message",function(data){onmessage({data:data})});var
nodeFS=require("fs");var nodeRead=function(filename){return nodeFS.readFileSync(filename,"utf8")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance==="undefined"){performance={now:function(){return Date.now()}}};";
  */
  * @license
  */

```


utChannels", "outputChannels", "outChannels", "isSamePad", "type", "InterpolationMethod", "wasmCropAndResize", "conv2DBackpropInputConfig", "Conv2DBackpropInput", "dy", "inputShape", "batchSize", "inHeight", "inWidth", "outHeight", "outWidth", "topPad", "leftPad", "isChannelsLast", "dxStrides", "dyStrides", "fltS0", "fltS1", "fltS2", "xBatchStride", "xRowStride", "xColStride", "xChannelStride", "yBatchStride", "yRowStride", "yColStride", "yChannelStride", "dyId", "cosConfig", "Cos", "coshConfig", "Cosh", "wasmCumsum", "cropAndResizeConfig", "CropAndResize", "castedData", "method", "extrapolationValue", "cropSize", "image", "boxes", "boxInd", "numBoxes", "cropHeight", "cropWidth", "imagesData", "imagesId", "boxesId", "boxIndId", "imagesShapeBytes", "wasmDepthToSpace", "cumsumConfig", "Cumsum", "exclusive", "reverse", "permutation", "permutedX", "permutedAxis", "permutedOut", "finalDim", "permutedXId", "permutedOutId", "getUndoAxesPermutation", "wasmDepthwiseConv2d", "depthToSpaceConfig", "DepthToSpace", "blockSize", "outputHeight", "outputWidth", "outputDepth", "outputShape", "xStridesBytes", "outputShapeBytes", "outputStrideBytes", "depthwiseConv2dNativeConfig", "DepthwiseConv2dNative", "\$dilations", "eluConfig", "Elu", "equalConfig", "Equal", "expConfig", "Exp", "expandDims", "dim", "\$dim", "splice", "expandDimsConfig", "ExpandDims", "fill", "value", "wasmFlipLeftRight", "fillConfig", "Fill", "wasmBatchNorm", "flipLeftRightConfig", "FlipLeftRight", "imageId", "batch", "imageHeight", "imageWidth", "numChannels", "floorConfig", "Floor", "floorDivConfig", "FloorDiv", "wasmFusedConv2d", "fusedBatchNormConfig", "FusedBatchNorm", "varianceEpsilon", "mean", "variance", "scale", "meanId", "varianceId", "offsetId", "scaleId", "wasmFusedDepthwiseConv2d", "fusedConv2DConfig", "FusedConv2D", "wasmGatherNd", "fusedDepthwiseConv2DConfig", "FusedDepthwiseConv2D", "wasmGather", "gatherNdConfig", "GatherNd", "params", "indices", "resultShape", "numSlices", "indicesShape", "sliceRank", "indicesId", "stridesBytes", "gatherV2Config", "GatherV2", "batchDims", "parsedAxis", "indicesVals", "axisDim", "index", "shapeInfo", "segment_util", "collectGatherOpShapeInfo", "flattenX", "dimSize", "indicesSize", "flattenIndex", "flattenOutputShape", "stridesSize", "greaterConfig", "Greater", "greaterEqualConfig", "GreaterEqual", "wasmMax", "leakyReluConfig", "LeakyRelu", "alpha", "lessConfig", "Less", "lessEqualConfig", "LessEqual", "logConfig", "Log", "logicalAndConfig", "LogicalAnd", "wasmMaxPool", "maxConfig", "Max", "maximumConfig", "Maximum", "wasmMean", "maxPoolConfig", "MaxPool", "wasmMin", "meanConfig", "Mean", "reductionAxes", "castedInput", "MirrorPaddingMode", "wasmMirrorPad", "minConfig", "Min", "minimumConfig", "Minimum", "mirrorPadConfig", "MirrorPad", "paddings", "mode", "p", "prePaddingsFlat", "padTuple", "postPaddingsFlat", "prePaddingsBytes", "postPaddingsBytes", "multiplyConfig", "Multiply", "negConfig", "Neg", "parseResultStruct", "resOffset", "HEAPU8", "pSelectedIndices", "selectedSize", "pSelectedScores", "pValidOutputs", "_free", "nonMaxSuppressionV3Config", "NonMaxSuppressionV3", "iouThreshold", "maxOutputSize", "scoreThreshold", "scores", "scoresId", "nonMaxSuppressionV4Config", "NonMaxSuppressionV4", "padToMaxOutputSize", "wasmOneHot", "nonMaxSuppressionV5Config", "NonMaxSuppressionV5", "softNmsSigma", "notEqualConfig", "NotEqual", "oneHotConfig", "OneHot", "depth", "onValue", "offValue", "onesLikeConfig", "OnesLike", "wasmPadV2", "packConfig", "Pack", "assertShapesMatch", "intermediateTensorInfos", "expandedT", "wasmPrelu", "padV2Config", "PadV2", "constantValue", "powConfig", "Pow", "wasmProd", "preluConfig", "Prelu", "weightsId", "wasmResizeBilinear", "prodConfig", "Prod", "rangeConfig", "Range", "start", "stop", "step", "makeZerosTypedArray", "numElements", "abs", "ceil", "rangeImplCPU", "realDivConfig", "RealDiv", "reluConfig", "Relu", "relu6Config", "Relu6", "wasmReverse", "resizeBilinearConfig", "ResizeBilinear", "images", "alignCorners", "halfPixelCenters", "newHeight", "newWidth", "oldHeight", "oldWidth", "xDData", "wasmRotate", "reverseConfig", "Reverse", "dims", "axesBytes", "outShapeBytes", "wasmScatterNd", "rotateWithOffsetConfig", "RotateWithOffset", "radians", "fillValue", "center", "centerX", "centerY", "fillValues", "fillBytes", "roundConfig", "Round", "rsqrtConfig", "Rsqrt", "wasmSelect", "scatterNdConfig", "ScatterNd", "updates", "numUpdates", "outputSize", "updatesId", "selectConfig", "Select", "condition", "e", "conditionId", "tId", "eId", "cRank", "tRank", "sigmoidConfig", "Sigmoid", "sinConfig", "Sin", "softmaxConfig", "Softmax", "logits", "spaceToBatchNDConfig", "SpaceToBatchND", "completePaddings", "paddedX", "reshapedPaddedShape", "permutedReshapedPaddedPermutation", "flattenShape", "paddedXReshaped", "paddedXT", "wasmStep", "splitVConfig", "SplitV", "numOrSizeSplits", "\$axis", "splitSizes", "prepareSplitSize", "s", "xSliceSize", "xSlice", "sqrtConfig", "Sqrt", "squareConfig", "Square", "squaredDifferenceConfig", "SquaredDifference", "wasmStridedSlice", "stepConfig", "Step", "wasmSum", "stridedSliceConfig", "StridedSlice", "end", "beginMask", "endMask", "ellipsisMask", "newAxisMask", "shrinkAxisMask", "finalShapeSparse", "finalShape", "isIdentity", "sliceDim0", "isSimpleSlice", "\$begin", "\$end", "\$strides", "sliced", "beginBytes", "endBytes", "subConfig", "Sub", "wasmTile", "sumConfig", "Sum", "tanConfig", "Tan", "tanhConfig", "Tanh", "wasmTopK", "tileConfig", "Tile", "re

ps", "newShapeBytes", "wasmTransform", "topKConfig", "TopK", "sorted", "outValues", "outValuesId", "outIndices", "outIndicesId", "transformConfig", "Transform", "fillModeId", "transforms", "interpolation", "fillMode", "transformsId", "interpolationModeId", "unpackConfig", "Unpack", "numOutputs", "outIndex", "outs", "zerosLikeConfig", "ZerosLike", "kernelConfigs_1", "_i", "kernelConfig", "registerKernel", "ENV", "env", "registerFlag", "WebAssembly", "validate", "MessageChannel", "port1", "postMessage", "SharedArrayBuffer", "_scriptDir", "WasmBackendModuleThreadedSimd", "document", "currentScript", "src", "undefined", "__filename", "GROWABLE_HEAP_I8", "wasmMemory", "updateGlobalBufferAndViews", "HEAP8", "GROWABLE_HEAP_U8", "GROWABLE_HEAP_I32", "HEAP32", "GROWABLE_HEAP_U32", "HEAPU32", "GROWABLE_HEAP_F64", "HEAPF64", "readyPromiseResolve", "readyPromiseReject", "Module", "Promise", "resolve", "reject", "key", "moduleOverrides", "hasOwnProperty", "quit_", "status", "toThrow", 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AS,GAACKS,GAC5B,WAAM,MAAA,uJAEsBJ,YAAoBC,UAEpD,IAEMzF,GADF0F,EAAYC,EAAY1K,EAAEkB,MAAMuG,MAAM,GAAI,GAACKxH,EAAEiB,MAAMuG,MAAM,GAAI,IACICmD,OAAO,CAACP,EAAaC,IAExDhI,OAAKOH,OACDS,IAAgBC,GACHB,WAAM,MAAA,kCAAKCD,YACjCC,8BAAuCPK,EAAEkB,cACzCjB,EAAEiB,yBAAwBZ,EAC7B,mBAAmBC,oBAE3B,IAEMsK,EAAWtK,EAaA,CAACmK,EAAWJ,EAAaF,GACzB,CAACM,EAAWN,EAAaE,GAGjDQ,EAAMxB,EAAQ,CAACxJ,OAAQ,CAACsC,EAAGpC,GAAIP,UAASM,MAAO,CAACmB,MANrCZ,EAAa,CAACmK,EAAWN,EAAaE,GACzB,CAACI,EAAWJ,EAAaF,MAMjDY,EAAMzB,EAAQ,CAACxJ,OAAQ,CAACsC,EAAGnC,GAAIR,UAASM,MAAO,CAACmB,MAAO2J,KAEvDG,EA AQvL,EAAQkB,UAAUC,IAAIkK,EAAIjK,QAAQC,GAC1CmK,EAAQxL,EAAQkB,UAAUC,IAAIkK,EAAIKK,QAAQC,GAE1CQ,EAAUhB,EAAawK,EAAI5J,MAAM,GAACK4J,EAAI5J,MAAM,GACHDK,EAAWHb,EAAawK,EAAI7J,MAAM,GAACK6J,EAAI7J,MAAM,GACjDM,EAAW0J,KAAKC,IAAIV,EAAWC,GAE/BjJ,EAAMhC,EAAQiC,WAAW,CAACF,EAAUF,EAASC,GAAWuJ,EAAI1K,OAC5DuB,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAE1Cc,EAAC,IAAIC,WAAW,IAAIC,WAAWgJ,EAAI5J,OAAOa,QACvDC,EAAC,IAAIH,WAAW,IAAIC,WAAWiJ,EAAI7J,OAAOa,QU7D,OARA6H,EACIoB,EAAOpJ,EAAakJ,EAAI5J,MAAMC,OAAQ8J,EAAOjJ,EAC7C+I,EAAI7J,MAAMC,OAAQb,EAAYC,EAAyOB,GAE9CIC,EAAQwH,YAAy6D,EAAIjK,QACxBpB,EAAQwH,YAAy8D,EAAIK,QAExBY,EAAIP,MAAQ6D,EACLtD,ICvGF,SAAS2J,EAAUC,EAAMC,EAACOC,EAAMrK,EAAOd,GACHD,MAAMoL,EAACc,aAAWC,iBAAiBxK,EAAOoK,EAACOC,GACxDpK,EAASmB,OAAKC,cAAcgJ,GAC5BI,EAAWrJ,OAAKsJ,eAAe1K,GACrC,GAAIsK,EAAa,CACb,MAAMK,EAAaJ,aAAWK,kBAakBR,EAAOK,GACvD,MAAc,WAAVvL,EACOIL,EAACK5D,MAAMoE,EAAYA,EAAa1K,GAExCkK,EA AKU,SAASF,EAAYA,EAAa1K,GAEID,MAAM6K,EAawB,WAAV5L,EACHB0C,eAAamJ,uBAAuBZ,GACpCA,EACEa,EAAQnK,SAAOb,EAAOd,EAAO4L,GAC7BG,EAASpK,SAAOwJ,EAAMnL,GAC5B,IAAK,IAAIkD,EAAI,EAAGA,EAAI6I,EAAOZ,OAAQjI,EAAG,CACIC,MAAM8I,EAASD,EAAOE,WAAW/I,GAC3BgJ,EAAQF,EA AOvI,KAAI,CAAC0I,EAACK3H,IAAM2H,EAAMjB,EAAM1G,KACjDuH,EAAOjI,IAAIgI,EAAMtL,OAAO0L,MAAWF,GAEvC,MAAc,WAAVhM,EACO0C,eAAa0J,uBAAuBL,EAAMOM,QAe/CN,EAAMOM,gBCpBFhF,EACZ5H,GACc,IAAAuC,aAAImC,UAAQ+G,UAAOC,SAAO9L,YAEpCqH,uCAAC4F,OAAQC,OAETnB,EAACc,aAAWC,iBAAiBtJ,EAAEIB,MAAOwL,EAAQC,GAC3DC,EAAQnN,EAAQoN,SAASzK,EAAEvB,QAC3BY,EAAMhC,EAAQiC,WAAWiL,EAAOvK,EAAEhC,OACICuL,EAAWrJ,OAAKsJ,eAAexJ,EAAEIB,OACjC4L,EAUrn,EAAQkB,UAAUC,IAAIa,EAAIZ,QAe1C,GAAI2K,EAAa,CACf,IAAMK,EAAaJ,aAAWK,kBAakBY,EAAQf,GAExD,GAAgB,WAAZvJ,EAAEhC,MACJ0M,EAAQC,YACHH,EACInF,MAAMoE,EAAYA,EAAavJ,OAAKC,cAAcoK,SAE3CIN,EAAQwE,mBAAmBxC,GACnCyC,IACH0I,EACIb,SAASF,EAAYA,EAAavJ,OAAKC,cAAcoK,KAGhE,OAAOIL,EAGT,GAAgB,WAAZW,EAAEhC,MAAOB,CACxB,IAAM4M,EAAMC,EAAaL,EAAOF,EAAQC,EAAOvK,EAAEIB,MAAOkB,EAAEhC,OAe1D,OADA0M,EAAQC,YAAcC,EACfvL,EAGT,IAAMyL,EA AUzN,EAAQwE,mBAAmBxC,GACrC0L,EAAO/K,EAAEIB,MAAMC,OACrB,GAAa,IAATgM,GAsBN,SACIP,EAAgCQ,EACHCF,EAAkC5B,EACICC,GAKF,IAJA,IAAI8B,EAAY,EACVC,EAAShC,EAAM,GACfIC,EAASjC,EAAM,GACfK,EAAOF,EAAS/B,EAAK,GACIBjI,EAAIgK,EAAQhK,EAAIkK,EAAMIK,IAAK,CACIC,IAAMmK,EAAUnK,EAAI8J,EAAUG,EAC9BL,EAAQhJ,IAAI0I,EAAMb,SAAS0B,EAASA,EAAUIC,EAAK,IAAK8B,GACxDA,GAAa9B,EAAK,IAhCIBmC,CACId,EAAqBjB,EAAS,GAAIuB,EAASR,EAC3CC,QACC,GAAa,IAATQ,GAiCb,SACIP,EAAGce,EAAkBC,EACIDV,EAAkC5B,EACICC,GAOF,IANA,IAAI8B,EAAY,EACVC,EAAShC,EAAM,GACfIC,EAASjC,EAAM,GACfIC,EAASjC,EAAM,GACfuC,EAASvC,EAAM,GACfK,EAAOF,EAAS/B,EAAK,GACrBuC,EAAOP,EAAShC,EAAK,GACIBjI,EAAIgK,EAAQhK,EAAIkK,EAAMIK,IAC7B,IAAK,IAAI8B,EAAI2I,EAAQ3I,EAAIkK,EAAMIJ,IAAK,CACIC,IAAM6I,EAAUnK,EAAIqK,EAAW/I,EAAIjJ,EAAWC,EAC9CX,EAAQhJ,IAAI0I,EAAMb,SAAS0B,EAASA,EAAUIC,EAAK,IAAK8B,GACxDA,GAAa9B,EAAK,IA9CpBwC,CACInB,EAAqBjB,EAAS,GAAIA,EAAS,GAAIuB,EAC/CR,EAAoCC,QACnC,GAAa,IAATQ,GAgDb,SACIP,EAAGce,EAAkBC,EACIDI,EAAkBd,EACIB5B,EACAC,GAUF,IATA,IAAI8B,EAAY,EACVC,EAAShC,EAAM,GACfIC,EAASjC,EAAM,GACfuC,EAASvC,EAAM,GACfK,EAAOF,EAAS/B,EAAK,GACrBuC,EAAOP,EAAShC,EAAK,GACrB0C,EAAOJ,EAASiC,EAAK,GACrB2C,EAAS5C,EAAM,GAEZhI,EAAIgK,EAAQhK,EAAIkK,EAAMIK,IAC7B,IAAK,IAAI8B,EAAI2I,EAAQ3I,EAAIkK,EAAMIJ,IAC7B,IAAK,IAAIuJ,EAAIN,EAAQM,EAAIF,EAAME,IAAK,CACIC,IAAMV,EAAUnK,EAAIqK,EAAW/I,EAAIjJ,EAAWO,EAAIH,EAawe,EAC7DhB,EAAQhJ,IAAI0I,EAAMb,SAAS0B,EAASA,EAAUIC,EAAK,IAAK8B,GACxDA,GAAa9B,EAAK,IAIEtB6C,CACIxB,EAAqBjB,EA

S,GAAIA,EAAS,GAAIA,EAAS,GAAIuB,EAC5DR,EACAC,OACC,CACCK,EACFC,EAAaL,EAAOF,EAAQC,EAAOvK,EAAEIB,MAAOkB,EAAEhC,OACID8M,EAAQhJ,IAAI8I,GAGd,OAAOvL,EA8DF,IAAM4M,AAA4B,CACvChP,WAAyIP,QACZ/O,YAAa,OACbK,WAAy6H,GChFP,IAAM8G,EAAqC,CACChDIP,WAAyMp,iBACZjP,YAAa,OACbK,WAZCF,SAAwBC,GAKf,IAAAC,WAAQL,YAASM,UACjBqC,MACAqM,eAAYC,UAEbC,EAAOF,EAAWG,QAAO,SAAC5O,EAAGC,GAAM,OAAAD,EAAIC,KAEvC4O,EAAW/L,eAAagM,YAAy1M,EAAEIB,MAAOuN,EAAYE,GACzDI,EAAWjM,eAAakM,YAAyH,EAAS1N,OAAQsN,EAAWtN,QACHe8N,EACFnM,eAAaoM,oBAAoB9M,EAAEIB,MAAOuN,EAAYE,GACpDQ,EACFrM,eAAasM,oBAAoBV,EAAOD,EAAWtN,QACjDkO,EACFvM,eAAawM,aAAaL,EAAkBP,EAAOD,EAAWtN,QAE5DoO,EAAYjG,EAAQ,CAACxJ,OAAQ,CAACsC,KAAI3C,UAASM,MAAO,CAACmB,MAAO2N,KAC1D3I,EACF5B,EAAU,CAACxE,OAAQ,CAACsC,EAAGmN,GAAY9P,UAASM,MAAO,CAACyE,KAAMuK,KAGxDS,EAAS/H,EAAM,CACnB3H,OAAQ,CAACsC,EAHiBkH,EACxB,CAACxJ,OAAQ,CAACsC,EAAG8D,GAAczG,UAASM,MAAO,CAACmB,MAAO+N,MAGrDxP,UACAM,MAAO,CAACuL,MAAO6D,EAAkB5D,KAAM8D,KAOzC,OAJA5P,EAAQwH,YAAyS,I,EAUU1O,QAC9BpB,EAAQwH,YAAyF,EAAYrF,QACChpB,EAAQwH,YAAyS,I,EAUU1O,QAEvB2O,aCtCOC,EACZ5P,GAEC,IAAAuC,aAAyHc,gBAAQX,YAC9BgC,EAAMhC,EAAQiC,WAAWU,EAAEIB,MAAOd,GACIC4D,EAASvE,EAAQwE,mBAAmB7B,GAG1C,OAFgB3C,EAAQwE,mBAAmBxC,GACnCyC,IAAIF,GACLvC,EAGF,ICZHiO,EDYSC,EAA2B,CACtCtQ,WAAyUQ,OACZrQ,YAAa,OACbK,WAAy6P,GEhBDI,EAA2B5N,EAAwB6N,QD2BzD,IAAMC,EAAkC,CAC7C1Q,WAAy2Q,cACZzQ,YAAa,OACbC,UA3BF,SAAeC,GACbiQ,EAAWjQ,EAAQC,KAAKC,MAAMqQ,cAAa,KAAiB,CAC1D,SACA,SACA,SACA,YAuBFpQ,WAnBF,SAAcC,GAKL,IAAAC,WAAQL,YAASM,UACjBqC,MACA6N,iBAACc,iBACf7N,EAAM5C,EAAQkB,UAAUC,IAAIwB,EAAEvB,QAAQC,GACtCW,EAAMhC,EAAQiC,WAAWU,EAAEIB,MAAOkB,EAAEhC,OACpCuB,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAlZ,QAAQC,GAehD,OADA4O,EAASrN,EAk4N,EAAC,EAAcvO,GACnCF,aEpBomJ,EACZ/K,GACK,IAAAC,WAAQL,YAETiG,EAAOpD,OAAKwD,eAAejG,EAAKE,MAAM2F,KAAM5F,EAAO,GAAGoB,OAAO,GAE/D6D,EAAWjC,eAAaoC,gBAAGBpF,EAAO+D,KAAI,SAAAsM,GAk,OAAA,A,EAAEjP,SAAQwE,GAGhE0K,EAAUtQ,EAAOuQ,QAAO,SAAAF,GAk,OAAA7N,OAAKC,cAAc4N,EAAEjP,OAAS,KACjE,GAAuB,IAAnBkP,EAAQjP,OACV,OAAO4C,EAAS,CAACjE,OAAQ,CAACsC,EAAGgO,EAAQ,IAAK3Q,YAG5C,IAAMgC,EAAMhC,EAAQiC,WAAWqD,EAAUjF,EAAO,GAAGM,OAEnD,GAAqC,IAAjCkC,OAAKC,cAAcwC,GACrB,OAAOtD,EAGT,IAAM6O,EAASF,EAAQvM,KAAI,SAAAsM,GAk,OAAAA,EA AEjP,SAGIC,GAFA4B,eAAayN,uBAAuBD,EAAQ5K,GAEnB,WAArB0K,EAAQ,GAAGhQ,MAAoB,CAQjC,IAAMoQ,EAAWJ,EAAQvM,KAAI,SAAAsM,GAC3B,IAAMxI,EAAYrF,OAAKC,cAAc4N,EA AEjP,MAAMuG,MAAM/B,IAEnD,OAAO4D,EAAQ,CAACxJ,OAAQ,CAACsC,EAAG+N,GAAl1Q,UAASM,MAAO,CAACmB,MADnC,EAAE,EAAGyG,SAIf8I,EAAkBD,EAAS3M,KAAI,SAAAsM,GACnC,MAAO,CAAC9E,KAAM5L,EA AQoN,SAASd,EAAEtP,QAASK,MAAOiP,EA AEjP,UAIrD6D,EACIjC,eAAaoC,gBAAGbSL,EAAS3M,KAAI,SAAAsM,GAk,OAAAA,EA AEjP,SAAQ,GAC7D,IAAMwP,EAawC,IAAzBF,EAAS,GAAGtP,MAAM,GACjCyP,ECpDH,SAAoB7Q,EAAQiF,EAUU3E,EAAOsQ,GACHd,MAAMxD,EAUU5K,OAAKsO,kBAakBxQ,EAAOkC,OAAKC,cAAcwC,IACjE,GAAl2L,GAA0B,WAAVtQ,EAAoB,CAEpC,IAAIyQ,EAAS,EACb/Q,EAAOgR,SAA QnK,IACX,MAAM4E,EAAOjJ,OAAKC,cAAcoE,EAAMzF,OACtCgM,EAAQhJ,IAAIyC,EAAM0E,KAAMwF,GACxBA,GAAUf,SAGb,CACD,IAAIwF,EAAY,EACbJr,EAAOgR,SAAQnK,IACX,MAAMqF,EAawB,WAAV5L,EACb0C,eAAamJ,uBAAuBtF,EAAM0E,MAC1C1E,EAAM0E,KACV,IAAI2F,EAAO,EACX,IAAK,IAAIC,EAAM,EAAGA,EAAMtK,EAAMzF,MAAM,KAAM+P,EAk,CAC3C,MAAMC,EAASD,EAAMIM,EAAS,GA AKgM,EACnC,IAAK,IAAIL,EAAM,EAAGA,EAAMxK,EAAMzF,MAAM,KAAMiQ,EACtCjE,EAAQgE,EAASC,GAAOnF,EAAYgF,KAG5CD,GAAapK,EAAMzF,MAAM,MAGjC,OAAOgM,EDyBSkE,CACIX,EAaiB1L,EA AUjF,EAAO,GAAGM,MACrCsQ,GAEdW,EACFvO,eAAaoC,gBAAGbKL,EAAQvM,KAAI,SAAAsM,GAk,OAAAA,EA AEjP,SAAQwE,GAQ5D,ONAjE,EAaip,MAAQmQ,EACI5R,EAAQkB,UAAUC,IAAIa,EAAlZ,QAC IckM,YAAcJk,eAAa0J,uBAAuBmE,GAElDH,EAASM,SAAQ,SAAAX,GAk,OAAA1Q,EAAQwH,YAAyKJ,EA AEtP,WAErCY,EAYT,IATA,IAAMD,EAawC,OAAKC,cAAc6N,EAAQ,GAAGiP,MAAMuG,MAAM,EAAG/B,IAC1D4L,EAAe,EACbC,EAAYnB,EAAQvM,KAAI,SAAA8C,GAC5B,IAAM6K,EAawIP,OAAKC,cAAcoE,EA AMzF,MAAMuG,MAAM/B,IAEtD,OADA4L,GAAGBE,EACTA,KAehxN,EAASoM,EAAQvM,KAAI,SAAA8C,GAAS,OAAAIH,EAAQwE,mBAAmB0C,MACzDuG,EAAUzN,EAAQwE,mBAAmBxC,GACICxB,EAAl,EAAG

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=====\n*\n\n// Import core for side effects (e.g. flag registration)\nimport '@tensorflow/tfjs-core';\n\n// tslint:disable-next-line:no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/public/chained_ops/register_all_chained_ops';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/register_all_gradients';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport {setTestEnvs, setupTestFilters, TestFilter} from\n '@tensorflow/tfjs-core/dist/jasmine_util';\n\n// tslint:disable-next-line: no-exports-from-dist\nsetTestEnvs([\n  {name: 'test-wasm', backendName: 'wasm', isDataSync: true}],\n);\n\n// Tests that have these substrings in their name will be included unless one\n// of the strings in excludes appears in the name.\nconst TEST_FILTERS: TestFilter[] = [\n  {\n    startsWith: 'tensor',\n    excludes: [\n      'complex', // Complex numbers not supported yet\n      'derivative', // Gradients not yet supported\n      // Downcasting broken, see: https://github.com/tensorflow/tfjs/issues/2590\n      'Tensor2D float32 -> bool',\n      'Tensor2D int32 -> bool'\n    ]\n  },\n  {\n    include: 'softmax',\n    {\n      include: 'pow',\n      excludes: [\n        'gradient', // zerosLike not defined yet\n        'broadcasting same rank Tensors different shape', // Broadcasting along\n          // inner dims not\n          // supported yet\n      ]\n    },\n    {\n      include: 'add',\n      excludes: [\n        'gradient', // Gradient is missing\n        'upcasts when dtypes dont match', // Uses the 'complex' dtype\n        'complex', // Complex numbers not supported yet\n      ]\n    },\n    {\n      include: 'depthToSpace',\n      {\n        include: 'avgPool',\n        excludes: [\n          'gradient', // Not yet implemented\n          'avgPool3d', // Not yet implemented\n        ]\n      },\n      {\n        include: 'relu',\n        excludes: [\n          'derivative', // Not yet implemented\n          'gradient', // Not yet implemented\n          'valueAndGradients', // Not yet implemented\n          'broadcasted bias', // Not yet implemented\n          'fused A x B with 2d bias' // Fused matMul with 2D bias not yet\n            // supported\n        ]\n      },\n      {\n        include: 'maxPool',\n        excludes: [\n          'maxPoolBackprop', // Not yet implemented\n          'maxPool3d', // Not yet implemented\n          'maxPool3dBackprop', // Not yet implemented\n          'ignores NaNs', // Actual != expected\n          'maxPoolWithArgmax' // Not yet implemented\n        ]\n      },\n      {\n        include: 'cropAndResize',\n      },\n      {\n        include: 'resizeBilinear',\n        excludes: [\n          'gradients', // Not yet implemented\n        ]\n      },\n      {\n        include: 'matmul',\n        excludes: [\n          'valueAndGradients', // Gradients not defined yet\n          'gradient', // Gradients not defined yet\n          'zero in its shape', // Zero in shapes aren't supported yet\n          'matmul followed by mul', // mul not supported yet\n          'upcasts', // Upcasting not supported yet\n          'fused A x B with 2d bias', // Fused matMul with 2D bias not yet\n            // supported\n        ]\n      },\n      {\n        include: 'depthwiseConv2D',\n        excludes: [\n          'broadcasted bias', // Broadcasted bias not yet supported\n          'gradient', // Gradients not defined yet\n          'NCHW', // xnn pack does not support channels first\n        ]\n      },\n      {\n        include: 'conv2d',\n        excludes: [\n          'broadcasted bias', // Broadcasted bias not yet supported\n          'gradient', // Gradients not defined yet\n          'backProp input x=[2,3,3,1] f=[2,2,1,1] s=1 p=0', // Gradients not\n            // supported\n        ]\n      }\n    ]\n  }\n];
```



```

// defined.\n    'NCHW', // xnn pack does not support channels first.\n    // Issue:
https://github.com/tensorflow/tfjs/issues/3104.\n    // Actual != expected.\n    'relu bias stride 2 x=[1,8,8,16]
f=[3,3,16,1] s=[2,2] d=8 p=same',\n    'prelu bias stride 2 x=[1,8,8,16] f=[3,3,16,1] s=[2,2] d=8 p=same',\n    ]\n
},\n {include: 'conv2dTranspose ', excludes: ['gradient']},\n {\n include: 'prelu',\n excludes: [\n 'gradient', //
Gradient is missing.\n 'derivative' // Missing gradient.\n ]\n },\n {\n include: 'cast',\n excludes: [\n
'complex', // Complex numbers not yet implemented.\n 'shallow slice an input that was cast' // Slice is not
implemented.\n ]\n },\n },\n {\n include: 'gather',\n excludes: [\n 'gradient' // Not yet implemented.\n ]\n },\n
{\n include: 'sigmoid',\n excludes: [\n 'sigmoidCrossEntropy', // Not yet implemented.\n 'gradient'
// Not yet implemented.\n ]\n },\n {\n include: 'scatterND ',\n {\n include: 'abs',\n excludes: [\n 'gradient',
// Not yet implemented.\n 'complex' // Complex numbers not supported yet.\n ]\n },\n {\n include: 'sub',\n
excludes: [\n 'complex', // Complex numbers not yet implemented.\n 'gradient', // Not yet implemented.\n
'upcasts', // Upcasting not supported yet.\n ]\n },\n {\n include: 'mul',\n excludes: [\n 'complex', //
Complex numbers not yet supported.\n 'gradient', // Gradient not defined yet.\n ]\n },\n {\n include: 'div',\n
excludes: [\n 'gradient', // Gradient not defined yet.\n 'upcasts', // Cast not supported yet.\n 'divNoNan' //
divNoNan not yet implemented.\n ]\n },\n {\n include: 'batchNorm',\n excludes: [\n 'gradient' // Gradient
is missing.\n ]\n },\n {\n include: 'slice',\n {\n include: 'stridedSlice ',\n {\n include: 'rotate',\n {\n
include: 'rotateWithOffset',\n {\n include: 'flipLeftRight ',\n {\n include: 'square ',\n {\n include: 'squaredDifference'},\n {\n
startsWith: 'min',\n excludes: [\n '2D, axis=0', // Permuted axes requires transpose, which is not yet\n
// implemented.\n 'index corresponds to start of a non-initial window', // argMin not yet\n
// implemented.,\n 'gradient' // Gradients not yet implemented\n ]\n },\n {\n startsWith: 'max',\n
excludes: [\n 'gradient' // Gradients not yet implemented\n ]\n },\n {\n include: 'concat',\n excludes:
[\n 'complex', // Complex numbers not supported yet\n 'gradient' // Split is not yet implemented\n ]\n },\n
{\n include: 'transpose',\n {\n include: 'oneHot',\n {\n include: 'split',\n {\n include: 'pad ', excludes: ['complex',
'zerosLike']},\n {\n include: 'clip',\n excludes: [\n 'gradient',\n 'propagates NaNs' // clip delegates to
XNNPACK which does not make\n // guarantees about behavior of nans.\n ]\n },\n {\n include:
'addN',\n {\n include: 'nonMaxSuppression',\n {\n include: 'argmax', excludes: ['gradient']},\n {\n include: 'exp ',\n {\n
include: 'elu',\n excludes: [\n 'derivative', // Not yet implemented.\n 'gradient', // Not yet implemented.\n
'selu' // Not yet implemented.\n ]\n },\n {\n include: 'unstack',\n {\n include: 'minimum',\n excludes: [\n
'gradient',\n // Not yet implemented.\n 'broadcasts 2x1 Tensor2D and 2x2 Tensor2D' //
Broadcasting along inner\n // dims not supported yet.\n ]\n },\n {\n include:
'maximum',\n excludes: [\n 'gradient',\n // Not yet implemented.\n 'broadcasts 2x1
Tensor2D and 2x2 Tensor2D' // Broadcasting along inner\n // dims not supported
yet.\n ]\n },\n {\n include: 'log ',\n },\n {\n startsWith: 'equal ',\n excludes: [\n 'broadcasting Tensor2D
shapes', // Broadcasting along outer dims not\n // supported yet.\n 'broadcasting
Tensor3D shapes', // Same as above.\n 'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n ]\n
},\n {\n include: 'greater ',\n excludes: [\n 'broadcasting Tensor2D shapes', // Broadcasting along outer dims
not\n // supported yet.\n 'broadcasting Tensor3D shapes', // Same as above.\n
'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n ]\n },\n {\n include: 'greaterEqual',\n
excludes: [\n 'gradient',\n // Not yet implemented.\n 'broadcasting Tensor2D shapes', //
Broadcasting along outer dims not\n // supported yet.\n 'broadcasting Tensor3D shapes', // Same as above.\n
'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n ]\n },\n {\n include:
'less ',\n excludes: [\n 'broadcasting Tensor2D shapes', // Broadcasting along outer dims not\n
// supported yet.\n 'broadcasting Tensor3D shapes', // Same as above.\n 'broadcasting Tensor3D
float32', // Same as above.\n 'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n ]\n },\n {\n
include: 'lessEqual',\n excludes: [\n 'gradient',\n // Not yet implemented.\n 'broadcasting
Tensor2D shapes', // Broadcasting along outer dims not\n // supported yet.\n
'broadcasting Tensor3D shapes', // Same as above.\n 'broadcasting Tensor3D float32', // Same as above.\n
'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n ]\n },\n {\n include: 'notEqual',\n excludes:

```



```
{BackendWasm} from './backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as\n  {} as KernelFunc,\n};\n}}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/dist/kernels/OnesLike.js.map
```

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```
* =====*/
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/clamp_impl.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/non_max_suppression_impl.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/Sub.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/Sigmoid_test.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/_FusedMatMul.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/FusedDepthwiseConv2D.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/Exp.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/CropAndResize.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/leakyrelu_impl.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/check_macros.h
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/Mean.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/binary.cc
```

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
zip/tfjs-backend-wasm/src/cc/kernels/Softmax_test.cc
```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedConv2D.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/AddN.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/transpose_impl.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/LogicalAnd.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MaxPool.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MaxPool_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Multiply.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Reverse.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/transpose_impl.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ClipByValue.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Tanh.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Min.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/conv2d_impl.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2D_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Pow.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Transpose.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/leakyrelu_impl.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ScatterNd.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prelu.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/backend_test.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/AvgPool.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Cos.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sin.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/DepthwiseConv2dNative.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2D.h

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Rsqrt.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sum.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ClipByValue.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Minimum.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/conv2d_impl.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Square.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedConv2D_test.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/interpolate_bilinear_impl.h
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Add.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Relu6.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/ResizeBilinear.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedBatchNorm.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2D.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Less.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sigmoid.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedDepthwiseConv2D.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Max.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NonMaxSuppressionV5.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/interpolate_bilinear_impl.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/backend.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/sigmoid_impl.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/FusedDepthwiseConv2D_test.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/util.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/PadV2.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Greater.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NonMaxSuppressionV3.cc
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/AvgPool.cc

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MaxPool.h
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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/GreaterEqual.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/DepthwiseConv2dNative.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Maximum.cc

No license file was found, but licenses were detected in source scan.

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AA6B;CAC1C,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ZerosLike.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\n\nlet wasmStep:\n(xId: number, alpha: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:\nBackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number', // x_id\n    'number', // alpha\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function step(\n    args: {\n      backend:\n      BackendWasm, inputs: StepInputs, attrs: StepAttrs\n    }):\n    TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { alpha } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n      backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmStep(xId,\n      alpha, CppDType[x.dtype], outId);\n    return out;\n  }\n\n  export const stepConfig: KernelConfig = {\n    kernelName:\n    Step,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: step as {} as KernelFunc\n  };}\n\n
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Step.js.map

No license file was found, but licenses were detected in source scan.

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```


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```
=====\n
*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n
'number', // channels\n 'number' // batch\n ]);\n\nfunction softmax(\n args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}): \n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} =
args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,
logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return
out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n\n}}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-  
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No license file was found, but licenses were detected in source scan.

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```

```

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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { FusableActivation } from
'./types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,\n  biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n  null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', //\n    leakyreluAlpha\n    'number' // out_id\n  ]);\n\n  function fusedBatchMatMul(args: {\n    inputs:\n      _FusedMatMulInputs,\n    backend: BackendWasm,\n    attrs: _FusedMatMulAttrs\n  }) {\n    const { inputs, backend,\n    attrs } = args;\n    const { a, b, bias, preluActivationWeights } = inputs;\n\n    if (a.dtype !== 'float32' || b.dtype !==\n    'float32') {\n      throw new Error(\n        `_FusedMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n    const aId =\n    backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n\n    let biasId = 0;\n    if (bias !== null) {\n      const biasData = backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n          `_FusedMatMul only supports rank-1 bias but got ` +\n          `rank\n          ${biasData.shape.length}.`);\n      }\n      biasId = biasData.id;\n    }\n    const preluActivationWeightsId =\n    preluActivationWeights == null ?\n    0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n    const\n    fusedActivation =\n    FusableActivation[activation as { } as keyof typeof FusableActivation];\n    if\n    (fusedActivation == null) {\n      throw new Error(\n        `${activation} activation not yet supported for\n        FusedConv2D ` +\n        `in the wasm backend.`);\n    }\n    const leftDim = transposeA ? a.shape[2] : a.shape[1];\n    const rightDim = transposeB ? b.shape[1] : b.shape[2];\n    const batchDim = a.shape[0];\n\n    const out =\n    backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes = new Uint8Array(new

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Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  transposeA,\n  transposeB, fusedActivation, biasId, preluActivationWeightsId,\n  leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n  kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n  'number', // x_id\n  'number', // dtype\n
'number', // out_id\n  ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs});\n\n
TensorInfo {\n  const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const
out = backend.makeOutput(x.shape, outType || x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n
wasmFunc(xId, CppDType[x.dtype], outId);\n  return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport
function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:
DataType): KernelConfig {\n let wasmFunc:\n  (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n  bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n function
setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(kernelName, null /*
void */, [\n  'number', // a_id,\n  'array', // a_shape\n  'number', // a_shape.length\n  'number', // b_id\n
'array', // b_shape\n  'number', // b_shape.length\n  'number', // dtype\n  'number' // out_id\n  ]);\n }\n\n
function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs});\n\n TensorInfo {\n  const {backend,

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inputs } = args;\n  const { a, b } = inputs;\n  const aId = backend.dataIdMap.get(a.dataId).id;\n  const bId =
backend.dataIdMap.get(b.dataId).id;\n\n  const outputType = dtype != null ? dtype : a.dtype;\n  const newShape =
backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n  const out = backend.makeOutput(newShape,
outputType);\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(newShape) === 0) {\n    return
out;\n  }\n\n  const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n  const bShapeBytes =
new Uint8Array(new Int32Array(b.shape).buffer);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
const kernelFunc = () => wasmFunc(\n    aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n    CppDType[a.dtype], outId);\n\n  // Currently only some float operations support full broadcast.\n  if
(supportsFullBroadcast && a.dtype === 'float32') {\n    kernelFunc();\n    return out;\n  }\n\n  const
aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n  const bBroadcastDims =
backend_util.getBroadcastDims(b.shape, newShape);\n  const loopsOverAllOfA = aBroadcastDims.every((v, i) =>
v === i);\n  const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n  if (loopsOverAllOfA &&
loopsOverAllOfB) {\n    kernelFunc();\n    return out;\n  } else {\n    throw new Error(\n      `Broadcasting
along outer dims is not yet `+\n      `supported for ${a.dtype} ${kernelName}.`);\n  }\n}\n\n  return
{kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*/\n\nimport { Add, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
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*/\n\nimport { AddN, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport
{ BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\nlet wasmFunc:\n  (inputIds:
Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n    void;\n\nfunction setupFunc(backend:
BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n    'array', // input_ids\n
'number', // input_ids.length\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction addn(args: {inputs:
TensorInfo[], backend: BackendWasm}) {\n  const {inputs, backend} = args;\n  const out =
backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n  // Short-circuit zero-sized tensors.\n  if
(util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  const inputIds = inputs.map(x =>
backend.dataIdMap.get(x.dataId).id);\n  const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n
const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmFunc(inputIdsBytes, inputIds.length,
CppType[out.dtype], outId);\n\n  return out;\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName:
AddN,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: addn as { } as KernelFunc,\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *\n

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, backend} =\n  args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'wasm',\n  kernelFunc: identity as {} as\n  KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n\n=====\n\n
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=====\n\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from\n './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n  xId: number, xShape: Uint8Array,\n  xShapeLength: number, dtype: CppDType,\n  outId: number, perm: Uint8Array, permLength: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n  void *, [\n  'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // dtype\n  'number', // outId\n  'array', // perm\n  'number', // perm.length\n  ]);\n}\n\nexport function transpose(\n  args: {\n  inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs\n}): TensorInfo {\n  const {inputs,\n  backend, attrs} = args;\n  // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n  // better\n  // due to simpler memory access pattern.\n  const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n  attrs.perm);\n  let permIsNoOp = true;\n  for (let i = 0; i < perm.length; i++) {\n    if (perm[i] !== i) {\n      permIsNoOp = false;\n    }\n  }\n  const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n  const x = {\n  dataId: inputs.x.dataId,\n  shape: reducedShape,\n  dtype: inputs.x.dtype\n};\n  if (permIsNoOp) {\n    const\n  cloned = identity({inputs, backend});\n    cloned.shape = outShape;\n    return cloned;\n  }\n  const out =\n  backend.makeOutput(outShape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId =\n  backend.dataIdMap.get(out.dataId).id;\n  const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  wasmTranspose(\n    xId,\n    xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n    perm.length);\n  return\n  out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new\n  Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n  return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]\n{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if\n  (shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n     \n  newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =\n  0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n      (minValIdx === -1 || newPerm[minValIdx] >\n      newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,\n  newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:\n  'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright\n * 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n */\n\n=====\n\n
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n *\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[],\n  backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank = x.shape.length;\n\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let inputWasTransposed = false;\n\n  if (permutedAxes != null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n\n    axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
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=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null /*void*/, [number, number, number]);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =\n    util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =\n      backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any, null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =\n    util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =\n      backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: any as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
```

```
=====\n*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize: number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n}\n\nfunction argmax(\n  args: { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n  const { backend, inputs, attrs } = args;\n  const { axis } = attrs as { } as ArgMaxAttrs;\n  const { x } = inputs as { } as ArgMaxInputs;\n  const xId =\n    backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n  }\n\n  const outShape = input.shape.slice(0, -1);\n  const out =\n    backend.makeOutput(outShape, 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const outerSize =\n    util.sizeFromShape(out.shape);\n  const innerSize = input.shape[axes[0]];\n  wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as { } as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n */\n\n
```

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```
=====\n*\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n  strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n  ]);\n}\n\nfunction avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs, backend} = args;\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const channels = convInfo.inChannels;\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n      `was backend only supports average pooling with dilation = [1, 1], ` +\n      `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n  }\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],\n    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n  args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n    `shape must have the same number of elements.`);\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as { } as KernelFunc\n};\n\n"/**\n */\n
```


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```
=====\n*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from\n './Reshape';\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,\n  null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(`\n      BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ?\n    a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -\n    1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA =\n    util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const\n    batchDimsCompatible =\n    batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n    aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n    () => `Error in matMul: the input\n    batch dimensions must either be the\n    ` +\n    `same or at least one input batch dimension must be 1. Got input\n    ` +\n    `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n    batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n\n    const outShape =\n    outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n    innerShapeA === innerShapeB,\n    () => `Error in matMul: inner shapes (${innerShapeA}) and\n    ` +\n    `${innerShapeB} of Tensors with shapes\n    ${a.shape} and\n    ` +\n    `${b.shape} and transposeA=${transposeA}\n    ` +\n    ` and transposeB=${transposeB}\n    must match.`);\n\n    const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n    [batchDimA, outerShapeA, innerShapeA];\n    const b3dShape = transposeB ? [batchDimB, outerShapeB,\n    innerShapeB] :\n    [batchDimB, innerShapeB, outerShapeB];\n\n    // The rest of the\n    implementation is designed to operate on rank-3 tensors\n    const a3d = reshape({inputs: {x: a}, backend, attrs:\n    {shape: a3dShape}});\n    const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n    const a3dId =\n    backend.dataIdMap.get(a3d.dataId).id;\n    const b3dId =\n    backend.dataIdMap.get(b3d.dataId).id;\n\n    const leftDim =\n    transposeA ? a3d.shape[2] : a3d.shape[1];\n    const rightDim =\n    transposeB ? b3d.shape[1] : b3d.shape[2];\n\n    const batchDim =\n    Math.max(batchDimA, batchDimB);\n\n    const out =\n    backend.makeOutput([batchDim, leftDim,\n    rightDim], a3d.dtype);\n\n    const outId =\n    backend.dataIdMap.get(out.dataId).id;\n\n    const aShapeBytes =\n    new Uint8Array(new Int32Array(a3d.shape).buffer);\n    const bShapeBytes =\n    new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n    wasmBatchMatMul(\n    a3dId, aShapeBytes, a3d.shape.length, b3dId,\n    bShapeBytes,\n    b3d.shape.length, transposeA, transposeB, outId);\n\n    backend.disposeData(a3d.dataId);\n    backend.disposeData(b3d.dataId);\n\n    out.shape = outShape;\n    return out;\n  }\n\n  export const batchMatMulConfig:\n  KernelConfig = {\n    kernelName: BatchMatMul,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:\n    batchMatMul as {} as KernelFunc\n  };\n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
```

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```
=====\n*\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport { assertNotComplex } from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n  const isContinuous = slice_util.isSliceContinuous(shape, begin, size);\n  const length = util.sizeFromShape(size);\n  const xStrides = util.computeStrides(shape);\n  if (isContinuous) {\n    const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n    if (dtype === 'string') {\n      return vals.slice(flatOffset, flatOffset + length);\n    }\n    return vals.subarray(flatOffset, flatOffset + length);\n  }\n  const decodedData = dtype === 'string' ?\n    backend_util.fromUint8ToStringArray(vals) : vals;\n  const inBuf = buffer(shape, dtype, decodedData);\n  const outBuf = buffer(size, dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const outLoc = outBuf.indexToLoc(i);\n    const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n    outBuf.set(inBuf.get(...inLoc), ...outLoc);\n  }\n  if (dtype === 'string') {\n    return backend_util.fromStringArrayToUint8(outBuf.values);\n  }\n  return outBuf.values;\n}\nexport function slice(args) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { begin, size } = attrs;\n  assertNotComplex(x, 'slice');\n  const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n  slice_util.assertParamsValid(x, $begin, $size);\n  const vals = backend.data.get(x.dataId).values;\n  const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n  return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n  kernelName: Slice,\n  backendName: 'cpu',\n  kernelFunc: slice\n};\n/>\n\nsourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjojU2xpY2UuanMiLCJzb3VyY2VSb290IjojIiwicmNlcjI0Im5hbWVzIjpbXSswibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FIRztBQUVILE9BQU8sRUFBRyxZQUFZLEVBQWICLE1BQU0sRUFBC0MsS0FBSyxQUFFFLVBQVUsRUFBBUQsSUFBSxSxQUFDLE1BQU0sdUJQXVCLNBQUM7QUFHeEwsT0FBTyxQUFDLGDcQUFnQixQUFDLE1BQU0sYUFBYSxDQUFD00FBRTdDLE1BQU0sVUFBVxTQUFTLENBQ3JCLE1BQW1CLEVBQUUsS0FBZSxQUFFLE1BQWMsRUFBRxLQUFILEVBQ3JFLEtBQUW7SUFDAkIsTUFBTsXQUFXLEdBQUcsVUFBVxS0QUFDLGDcQUFnQixDQUFDLEtBQUssRUFBRxLQUFLLEVBQUUsSUFBSxS0QUFDLENBQUM7SUFDCeUsTUFBTsXNQFNLEdBQUcsSUFBSxS0QUFDLGFVLEVBQWEsQ0FBQyxJQUFJLENBQUMsQ0FBQztJUN4QyxNQFNLFBBQVEsR0FBRYxJQUFJLENBQUMsY0FBYyxDQUFDLEtBQUssQ0FBQyxDQUFD00IBRTVDLE1BQUksV0FBVyxQUFFO1FBQ2YsTUFBTsXVQUFVLEdBQUcsVUFBVxS0QUFDLGIcQUFpQixDQUFDLEtBQUssRUFBRxRQUFRLENBQUMsQ0FBQztRQUVqRSxJQUFJLEtBQUssS0FBSyxRQUFRLEVBQUU7WUFDdEIsT0FBUSxJQUFfQixDQUFDLEtBQUssQ0FBQyxVQUFVLEVBQUUsVUFBVxHQUFHLE1BQU0sQ0FBQyx0QUFD01NBQ3RFO1FBRUQsT0FBUSxJQUFfQixDQUFDLFFBQVEsQ0FBQyxVQUFVLEVBQUUsVUFBVxHQUFHLE1BQU0sQ0FBQyx0QUFD00tBQ3ZFO0IBRUQsTUFBTsXQUFXLEdBQUcsS0FBSyxLQUFLFFBQVEsQ0FBQyx0QUFD01FBQ3BDLFIBQVksQ0FBQyxzQkFBc0IsQ0FBQyxJQUFvQixDQUFDLENBQUMsQ0FBQztRQUMzRCxJQUFrQixDQUFD00IBRXZCLE1BQU0sS0FBSyxHQUFHLE1BQU0sQ0FBQyxLQUFLLEVBQUUsS0FBSyxQUFFLFdBQVcsQ0FBQyx0QUFD00IBQ2hELE1BQU0sTUFBTsXHQUFHLE1BQU0sQ0FBQyxJQUFJLEVBQUUsS0FBSyx0QUFDLENBQUM7SUFDbkMsS0FBSyxJQUFJLENBQUMsR0FBRYxDQUFDLEVBQUUsQ0FBQyxHQUFHLE1BQU0sQ0FBQyxJQUFJLEVBQUUsRUFBRxS0QUFDLEVBQUU7UUFDCeMsTUFBTsXNQFNLEdBQUcsTUFBTsX0QUFDLFBQVUsQ0FBQyx0QUFDLENBQUMsQ0FBQztRQUNwQyxNQFNLEtBQUssR0FBRYxNQFNLENBQUMsR0FBRYxDQUFDLENBQUMsR0FBVyxQUFFLENBQUMsRUFBRxS0QUFFLENBQUMsR0FBRYxHQUFHLEtBQUssQ0FBQyx0QUFDLENBQUMsQ0FBQyx0QUFD01FBQzdELE1BQU0sQ0FBQyxHQUFHLENBQUMsS0FBSyx0QUFDLEdBQUcsQ0FBQyxHQUFHLEtBQUssQ0FBQyxQUFFLEdBQUcsTUFBTsX0QUFDLENBQUM7S0FDNUM7SUFFRCxJQUFJLEtBQUssS0FBSyxRQUFRLEVBQUU7UUFDCeIsT0FBTyxZQUFZLENBQUMsc0JBQXNCLNBQUMsTUFBTsX0QUFDLE1BQ
```



```

const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n
}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n
}\n }\n }\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport
{ reshape } from './Reshape';\n\nimport { slice } from './Slice';\n\nimport { transpose } from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n
attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n\n backend.disposeData(xReshaped.dataId);\n\n return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n
backendName: 'wasm',\n kernelFunc: batchToSpaceND as { } as KernelFunc\n};\n", "/*\n * @license\n *
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specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport
{ TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nexport function
cast(\n args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n\n TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =

```

```
backend.tensorArrayFromHeap(x);\n const outVals = backend.tensorArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', // max\n    'number' // out_id\n  ]);\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend: BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId, clipValueMin, clipValueMax, outId);\n    return out;\n  }\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as KernelFunc\n  };\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {concatImplCPU} from './kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nexport function concat(\n  args: {\n    inputs: ConcatInputs,\n    backend: BackendWasm,\n    attrs: ConcatAttrs\n  }) {\n  const {inputs, backend} = args;\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n  let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n  // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length === 1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n  const out = backend.makeOutput(outShape, inputs[0].dtype);\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n  const shapes = $inputs.map(t => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n  if ($inputs[0].dtype === 'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-
```


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```
=====\n*\n\nimport { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmConv2d: (\n  xId:  
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,  
filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:  
number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,  
inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend:  
BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function conv2d(\n    args: { inputs: Conv2DInputs, backend:  
BackendWasm, attrs: Conv2DAttrs }) {\n    const { inputs, attrs, backend } = args;\n    const { x, filter } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const { strides, dilations, pad, dimRoundingMode, dataFormat } = attrs;\n    const $dataFormat =  
backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false,  
$dataFormat);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom =  
convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =  
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =  
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =  
convInfo.inChannels;\n    const outputChannels = convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type  
=== 'SAME' ? 1 : 0;\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend  
Conv2D does not support dataFormat:` +\n        ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n    }\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const outId =  
backend.dataIdMap.get(out.dataId).id;\n    wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId,  
filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight,  
dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n    return out;\n  }\n\n  export  
const conv2DConfig: KernelConfig = {\n    kernelName: Conv2D,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: conv2d as { } as KernelFunc\n  };  
}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights  
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```

```
=====\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,  
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from  
 './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
```

```

filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,\n
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n  const {dy, filter} = inputs;\n  const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n  const dilations = 1;\n\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n  dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n  const {\n    batchSize,\n    filterHeight,\n    filterWidth,\n    inChannels,\n
inHeight,\n    inWidth,\n    outChannels,\n    outHeight,\n    outWidth,\n    strideHeight,\n    strideWidth\n  } =
convInfo;\n\n  const topPad = filterHeight - 1 - convInfo.padInfo.top;\n  const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n  const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n  const dxStrides =
util.computeStrides(convInfo.inShape);\n  const dyStrides = util.computeStrides(dy.shape);\n  const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n  const xBatchStride = dxStrides[0];\n  const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n  const xColStride = isChannelsLast ? dxStrides[2] : 1;\n  const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n  const yBatchStride = dyStrides[0];\n  const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n  const yColStride = isChannelsLast ? dyStrides[2] : 1;\n  const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n  const out = backend.makeOutput(convInfo.inShape,
'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const dyId =
backend.dataIdMap.get(dy.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n    dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n    inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n    topPad, leftPad, fltS0, fltS1, fltS2,\n    xBatchStride, xRowStride,\n    xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n    yChannelStride, outId);\n  return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc:
conv2DBackpropInput as { } as KernelFunc\n};\n\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n", /**\n * @license\n *
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```
=====\n*\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number', // out id\n  ]);\n\n  function cropAndResize(args: {\n    backend: BackendWasm,\n    inputs: CropAndResizeInputs,\n    attrs: CropAndResizeAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { method, extrapolationValue, cropSize } = attrs;\n    const { image, boxes, boxInd } = inputs;\n    const numBoxes = boxes.shape[0];\n    const [cropHeight, cropWidth] = cropSize as [number, number];\n    const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n    let imagesData = backend.dataIdMap.get(image.dataId);\n    let castedData;\n    if (image.dtype !== 'float32') {\n      castedData = cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n      imagesData = backend.dataIdMap.get(castedData.dataId);\n    }\n    const imagesId = imagesData.id;\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n    const out = backend.makeOutput(outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n    wasmCropAndResize(\n      imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n      cropWidth,\n      InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n      extrapolationValue, outId);\n    if (castedData != null) {\n      backend.disposeData(castedData.dataId);\n    }\n    return out;\n  }\n\n  export const cropAndResizeConfig: KernelConfig = {\n    kernelName: CropAndResize,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: cropAndResize as {} as KernelFunc\n  };\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\nimport { transpose } from './Transpose';\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
```



```

const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n
wasmDepthToSpace(\n  xId, blockSize, channelsLast,\n  xStridesBytes, x.shape.length - 1,\n  outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n
return\n
out);\n\n
\nexport const depthToSpaceConfig: KernelConfig = {\n
kernelName: DepthToSpace,\n
backendName:\n
'wasm',\n
setupFunc: setup,\n
kernelFunc: depthToSpace as {} as KernelFunc\n
};\n\n
"/**\n
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 * the specific language governing permissions and\n
 * limitations under the License.\n
 */\n\n
=====\n\n
*/\n\n
import {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\n
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\n
import\n
{BackendWasm} from '../backend_wasm';\n\n
let wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,\n
inputHeight: number, inputWidth: number,\n
filterId: number, filterHeight: number, filterWidth: number, padTop:\n
number,\n
padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n
dilationHeight:\n
number, dilationWidth: number, strideHeight: number,\n
strideWidth: number, inputChannels: number,\n
outputChannels: number,\n
outId: number) => void;\n\n
function setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n
  backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n
    'number', /\n
    xId\n
    'number', // batchSize\n
    'number', // inputHeight\n
    'number', // inputWidth\n
    'number', //\n
    filterId\n
    'number', // filterHeight\n
    'number', // filterWidth\n
    'number', // padTop\n
    'number', //\n
    padRight\n
    'number', // padBottom\n
    'number', // padLeft\n
    'number', // isSamePad\n
    'number', //\n
    dilationHeight\n
    'number', // dilationWidth\n
    'number', // strideHeight\n
    'number', // strideWidth\n
    'number', // inputChannels\n
    'number', // outputChannels\n
    'number', // outId\n
  ]);\n\n
\n
function\n
depthwiseConv2d(args: {\n
inputs: DepthwiseConv2dNativeInputs,\n
backend: BackendWasm,\n
attrs:\n
DepthwiseConv2dNativeAttrs\n
}) {\n
const {inputs, attrs, backend} = args;\n\n
const {x, filter} = inputs;\n
const\n
xId = backend.dataIdMap.get(x.dataId).id;\n
const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const\n
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n
const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n
  (x as Tensor4D).shape, (filter as Tensor4D).shape,\n
strides,\n
  ($dilations as number | [number, number]), pad, dimRoundingMode,\n
  true /* depthwise */);\n\n
const filterHeight = convInfo.filterHeight;\n
const filterWidth = convInfo.filterWidth;\n
const padTop =\n
convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n
const padBottom = convInfo.padInfo.bottom;\n\n
const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n
const dilationWidth =\n
convInfo.dilationWidth;\n
const strideHeight = convInfo.strideHeight;\n
const strideWidth =\n
convInfo.strideWidth;\n
const inputChannels = convInfo.inChannels;\n
const outputChannels =\n
convInfo.outChannels;\n
const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n
if\n
(convInfo.dataFormat !== 'channelsLast') {\n
throw new Error(\n
  `wasm backend DepthwiseConv2dNative\n
  does not support dataFormat:` +\n
  ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n
const out =\n
backend.makeOutput(convInfo.outShape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmDepthwiseConv2d(\n
  xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n
  filterWidth,\n
  padTop, padRight, padBottom, padLeft, isSamePad,\n
  dilationHeight, dilationWidth, strideHeight, strideWidth,\n
inputChannels,\n
outputChannels, outId);\n\n
return out);\n\n
\n
\nexport const depthwiseConv2dNativeConfig:\n
KernelConfig = {\n
kernelName: DepthwiseConv2dNative,\n
backendName: 'wasm',\n
setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n
};\n\n
"/**\n
 * @license\n
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 * Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the "License");\n
 * you may not use this\n
 * file except in compliance with the License.\n
 * You may obtain a copy of the License at\n
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 * Unless required by applicable law or agreed to in writing,\n
 * software\n
 * distributed under the License is distributed on an\n
 * "AS IS" BASIS,\n
 * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n
```

```
=====\n\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n", "/*\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n
```

```
=====\n\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n
```

```
=====\n\n*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from\n './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =\n attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if\n (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${inputRank}]`);\n $dim = inputRank + dim\n + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:\n newShape}});\n\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n
```

```
*\n\nimport { KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { Fill, FillAttrs } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nexport function fill(args: { attrs: FillAttrs, backend: BackendWasm }) {\n  const { attrs: { shape, value, dtype }, backend } = args;\n  const out = backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'wasm',\n  kernelFunc: fill as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\nimport { FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: { inputs: FlipLeftRightInputs, backend: BackendWasm }): TensorInfo {\n  const { inputs, backend } = args;\n  const { image } = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch, imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as { } as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\nimport { Floor, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\nimport { FloorDiv, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\n  createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
```

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet\nwasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n  backend: BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId = backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmBatchNorm(\n    xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName: FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as {\n    KernelFunc\n};\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {FusableActivation} from './types';\n\nlet\nwasmFusedConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, biasId: number, padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, activation: number, preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n}\n\nfunction fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {strides, pad, dilations, dataFormat, dimRoundingMode, activation, leakyreluAlpha} = attrs;\n\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode);\n\n  const fusedActivation =\n
```



```

FusableActivation[activation as { } as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n  throw
new Error(\n    `${activation} activation not yet supported for FusedConv2D` +\n    `in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n  const biasData = backend.dataIdMap.get(bias.dataId);\n  if (biasData.shape.length !== 1) {\n
throw new Error(\n    `FusedConv2D only supports rank-1 bias but got` +\n    `rank
${biasData.shape.length}.`);\n  }\n  if (biasData.shape[0] !== outputChannels) {\n  throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not` +\n    `match the number of output channels
(${outputChannels})`);\n  }\n  biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n  throw new Error(\n    `wasm backend FusedConv2D does not support
dataFormat:` +\n    `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n  0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n  xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n  fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n  kernelName: FusedConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc:
fusedConv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasMfusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasMfusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n}\n\nfunction

```

```

fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as { }
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `{$activation}
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank {$biasData.shape.length}.`);\n }\n\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
({biasData.shape}) does not ` +\n `match the number of output channels ($outputChannels)`);\n }\n\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n `{$dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 : \n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n
'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', //
sliceSize\n 'array', // strides\n 'number' // outId\n ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return

```

```

out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,
outId);\n\n return out;\n }\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd};\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize:
number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array',
// xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', //
outStrides\n 'number' // outId\n ]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs});\n\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x,
indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index
= indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n
attrs: {\n shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize],\n backend\n });\n const
flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n
shapeInfo.sliceSize\n ];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n", "/**\n
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```
=====\n*\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n  createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // leakyrelu_alpha\n    'number', // out_id\n  ]);\n\n  export function leakyRelu(\n    args: {\n      inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm\n    }):\n    TensorInfo {\n    const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    // According to TF API, LeakyRelu returns float32 when input is either float32\n    // or int32.\n    const out = backend.makeOutput(x.shape, 'float32');\n\n    if (util.sizeFromShape(x.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmFunc(xId, CCppType[x.dtype], alpha, outId);\n    }\n\n    return out;\n  }\n\n  export const leakyReluConfig: KernelConfig = {\n    kernelName: LeakyRelu,\n    backendName: 'wasm',\n    setupFunc,\n    kernelFunc: leakyRelu as {} as KernelFunc,\n  }; \n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====  
*  
import { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';  
import { createBinaryKernelConfig } from './binary_kernel';  
const supportsFullBroadcast = false;  
export const lessEqualConfig: KernelConfig =  
  createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');  
/**  
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 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express  
 * or implied. See the License for the specific language governing  
 * permissions and limitations under the License.  
 */
```

```
=====  
*  
import { KernelConfig, Log } from '@tensorflow/tfjs-core';  
import { createUnaryKernelConfig } from './unary_kernel';  
export const logConfig: KernelConfig =  
  createUnaryKernelConfig(Log);  
/**  
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 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express  
 * or implied. See the License for the specific language governing  
 * permissions and limitations under the License.  
 */
```

```
=====  
*  
import { KernelConfig, LogicalAnd } from '@tensorflow/tfjs-core';  
import { createBinaryKernelConfig } from './binary_kernel';  
const supportsFullBroadcast = false;  
export const logicalAndConfig: KernelConfig =  
  createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');  
/**  
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 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express  
 * or implied. See the License for the specific language governing  
 * permissions and limitations under the License.  
 */
```

```
=====  
*  
import { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';  
import { BackendWasm } from '../backend_wasm';  
import { permuteAxesAndTranspose } from './kernel_utils';  
import { CppDType } from './types';  
let wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) => void;  
function setup(backend: BackendWasm): void {  
  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [number, // x_id  
  number, // dtype  
  number, // reduce_size  
  number, // out_id]);  
  function max(args: { backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }): TensorInfo {  
    const { backend, inputs, attrs } = args;  
    const { reductionIndices: axis, keepDims } = attrs;  
    const { x } = inputs;  
    const xId = backend.dataIdMap.get(x.dataId).id;  
    let inputId = xId;  
    let input = x;  
    const { transposed, axes, originalAxes, inputWasTransposed } =  
      permuteAxesAndTranspose(x, axis, backend);  
    if (inputWasTransposed) {  
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;  
      input = transposed;  
      inputId = transposedId;  
    }  
    const inputRank = input.shape.length;  
    backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);  
    const [outShape, reduceShape] =  
      backend_util.computeOutAndReduceShapes(input.shape, axes);  
    const reduceSize =
```

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util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n } \n\n if (inputWasTransposed) {\n  // dispose of the
transposed tensor.\n  backend.disposeData(transposed.dataId);\n } \n\n if (keepDims) {\n  // reshape\n  const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n } \n\n
return out;\n } \n\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: max as { } as KernelFunc\n};\n\n", /*\n * @license\n * Copyright 2019 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n", /*\n * @license\n * Copyright 2019 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', //
inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', //
padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //
inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnnpack which only\n  // supports float32.\n  //\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  //\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype
=== 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape,
filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =

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convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n  throw new Error(\n    `wasm
backend does not support dataFormat:~` +\n    ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n  xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n  padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { cast } from './Cast';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args:
{ backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs }):\n  TensorInfo {\n  const { backend, inputs,
attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes,
inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId
!== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input =
transposed;\n      inputId = transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'mean',
reductionAxes, input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput =\n    cast({ backend, inputs: { x: input }, attrs: { dtype: 'float32' }});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n  }\n\n  const out = backend.makeOutput(outShape, 'float32');\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n   
wasmMean(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed
tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  if (input.dtype
!== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n\n  return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as { }
as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util } from

```

```

'@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
import
{ permuteAxesAndTranspose } from './kernel_utils';
import { CppDType } from './types';
let wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>
void;
function setup(backend:
BackendWasm): void {
  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [
    'number', // x_id
    'number', // dtype
    'number', // reduce_size
    'number', // out_id
  ]);
  function min(args: { backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs }):
TensorInfo {
    const { backend, inputs, attrs } = args;
    const { axis, keepDims } = attrs;
    const { x } = inputs;
    const xId = backend.dataIdMap.get(x.dataId).id;
    let
inputId = xId;
    let input = x;
    const { transposed, axes, originalAxes, inputWasTransposed } =
permuteAxesAndTranspose(x, axis, backend);
    if (inputWasTransposed) {
      const transposedId =
backend.dataIdMap.get(transposed.dataId).id;
      if (transposedId !== xId) {
        // transpose was not a no-op. We
will need to dispose of this
        // once we are done.
        input = transposed;
        inputId = transposedId;
      }
    }
    const inputRank = input.shape.length;
    backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);
    const [outShape, reduceShape] =
backend_util.computeOutAndReduceShapes(input.shape,
axes);
    const reduceSize = util.sizeFromShape(reduceShape);
    const out = backend.makeOutput(outShape,
input.dtype);
    if (util.sizeFromShape(input.shape) !== 0) {
      const outId =
backend.dataIdMap.get(out.dataId).id;
      wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);
    }
    if
(inputWasTransposed) {
      // dispose of the transposed tensor.
      backend.disposeData(transposed.dataId);
    }
    if (keepDims) {
      // reshape
      const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);
      out.shape = newShape;
    }
    return out;
  }
  export const minConfig: KernelConfig = {
    kernelName: Min,
    backendName: 'wasm',
    setupFunc: setup,
    kernelFunc: min as {} as
KernelFunc
  };
}
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distributed under the License is distributed
on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
 * See the License for the specific language governing permissions and
limitations under the
License.
 */
=====
import { KernelConfig, Minimum } from '@tensorflow/tfjs-core';
import { createBinaryKernelConfig } from
'/binary_kernel';
const supportsFullBroadcast = false;
export const minimumConfig: KernelConfig =
createBinaryKernelConfig(Minimum, supportsFullBroadcast);
/**
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 * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
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limitations under the License.
 */
=====
import { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
import { CppDType } from './types';
// Must match
enum in MirrorPad.cc
enum MirrorPaddingMode {
  reflect = 0,
  symmetric = 1
}
let wasmMirrorPad: (
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,
prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,
outId: number) => void;
function
setup(backend: BackendWasm) {
  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [
    'number', // xId
    'array', // x.shape
    'number', // x.shape.length
    'number', // x.dtype
    'array', // pre-
paddings
    'array', // post-paddings
    'number', // mode
    'number', // outId
  ]);
  function
mirrorPad(args: {
inputs: MirrorPadInputs,
backend: BackendWasm,
attrs: MirrorPadAttrs
}) {
    const
{ inputs: { x }, backend, attrs: { paddings, mode } } = args;
    const outShape = paddings.map((p, i) => p[0] /*

```



```

beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const
postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as { } as KernelFunc,\n setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\ncreateBinaryKernelConfig(Multiply, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", "/*\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { BackendWasm } from '../backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n
pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`\n */\n\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:
number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const
pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const
pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n
backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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```
=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n
'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n
]);\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { iouThreshold,
maxOutputSize, scoreThreshold } = attrs;\n  const { boxes, scores } = inputs;\n\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const
resOffset =\n    wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n  const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n\n  const selectedIndicesTensor
=\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:
NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {} as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

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=====\n
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n  NonMaxSuppressionV4,\n  'number', // Result*\n  [\n    'number', // boxesId\n
'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', //
scoreThreshold\n    'bool', // padToMaxOutputSize\n  ]);\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n  const { backend, inputs, attrs } = args;\n  const { iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize } =\n    attrs;\n  const { boxes, scores } = inputs;\n\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const
resOffset = wasmFunc(\n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n  const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V4, we have to delete it from the
heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor,
```

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validOutputsTensor];\n\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n  kernelName: NonMaxSuppressionV4,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: nonMaxSuppressionV4 as {\n    as KernelFunc,\n  };,\n};\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n  (boxesId: number, scoresId: number, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n    number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[] {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma } = attrs;\n    const { boxes, scores } = inputs;\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n    const resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n    // Since we are not using validOutputs for V5, we have to delete it from the\n    // heap.\n    backend.wasm._free(pValidOutputs);\n    const selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n    const selectedScoresTensor =\n      backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n    return [selectedIndicesTensor, selectedScoresTensor];\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig = {\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc\n  } as KernelFunc;\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { KernelConfig, NotEqual } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const notEqualConfig: KernelConfig =\n  createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-
```

```

core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmOneHot: (\n  indicesId: number, depth:
number, onValue: number, offValue: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n    'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n}\n\nfunction
oneHot(\n  args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n  const {inputs,
backend, attrs} = args;\n  const {indices} = inputs;\n  const {depth, onValue, offValue} = attrs;\n\n  const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n  return out;\n}\n\nexport const oneHotConfig:
KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: oneHot as
{} as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.tensorArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const
onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as
{} as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {concat} from './Concat';\n\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {axis} =
attrs;\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n    }\n\n    const shape = inputs[0].shape;\n    const dtype = inputs[0].dtype;\n\n    inputs.forEach(t => {\n
util.assertShapesMatch(\n      shape, t.shape,\n      'All tensors passed to stack must have matching shapes');\n
util.assert(\n      dtype === t.dtype,\n      () => 'All tensors passed to stack must have matching dtypes');\n    });\n\n    const intermediateTensorInfos: TensorInfo[] = [];\n    const expandedTensors = inputs.map(t => {\n      const
expandedT =\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n      intermediateTensorInfos.push(expandedT);\n      return expandedT;\n    });\n\n    const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n    intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n    return result;\n  }\n\nexport const packConfig: KernelConfig = {\n  kernelName:
Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as {} as KernelFunc,\n};\n", "/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { fill } from './Fill';\nimport { CppDType } from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);\n}\n\nfunction pad(\n  args: { inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs }) {\n  const { inputs: { x }, backend, attrs: { paddings, constantValue } } = args;\n\n  const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n    return fill({\n      backend,\n      attrs: { shape: outShape, value: constantValue, dtype: x.dtype }\n    });\n  }\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const outTensorData = backend.dataIdMap.get(out.dataId);\n  const outId = outTensorData.id;\n\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmPadV2(\n    xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes, constantValue, outId);\n  return out;\n}\n\nexport const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport { KernelConfig, Pow } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n  createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' // out_id\n  ]);\n}\n\nfunction prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n  const { inputs, backend } = args;\n  const { x, alpha } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const weightsId =
```

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backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if
(input.dtype !== 'float32') {\n  castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n  inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype
!== 'float32') {\n  backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig:
KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as { } as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n
'number',\n    'number'\n  ]);\n}\n\nfunction prod(args: {\n  backend: BackendWasm,\n  inputs: ProdInputs,\n
attrs: ProdAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n
const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n
const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n  let
reductionAxes = axes;\n  if (inputWasTransposed) {\n    const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We
will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n
reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n  }\n
backend_util.assertAxesAreInnerMostDims(\n    'prod', reductionAxes, input.shape.length);\n  const [outShape,
reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize
= util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: prod as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {rangeImplCPU} from './kernel_utils/shared';\n\nexport const
range =\n  (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n    const {backend, attrs} =
args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n
const out = backend.makeOutput([values.length], dtype);\n    const outVals =

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { cast } from './Cast';\n\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', // oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', // newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n}\n\nfunction resizeBilinear(args: {\n  backend: BackendWasm,\n  inputs: ResizeBilinearInputs,\n  attrs: ResizeBilinearAttrs\n}): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { images } = inputs;\n  const { alignCorners, halfPixelCenters, size } = attrs;\n  const [newHeight, newWidth] = size;\n  const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n  const outShape = [batch, newHeight, newWidth, numChannels];\n  let xData = backend.dataIdMap.get(images.dataId);\n  let castedData;\n  if (xData.dtype !== 'float32') {\n    castedData =\n      cast({ backend, inputs: { x: images }, attrs: { dtype: 'float32' }});\n    xData =\n      backend.dataIdMap.get(castedData.dataId);\n  }\n  const xId = xData.id;\n  const out =\n    backend.makeOutput(outShape, 'float32');\n  if (util.sizeFromShape(images.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmResizeBilinear(\n    xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n    alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n  if (castedData != null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\n\nexport const\nresizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: resizeBilinear as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * \n * \n */\n\n=====\n*\n\nimport { KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { identity } from './Identity';\nimport { reshape } from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number' // out_id\n  ]);\n}\n\nexport function reverse(\n  args: {\n    inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs\n  }): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { dims } = attrs;\n  const axes = util.parseAxisParam(dims, x.shape);\n  if (x.shape.length === 0) {\n    return identity({ inputs: { x }, backend });\n  }\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n  const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n  wasmReverse(\n    xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n  const reshaped =\n    reshape({ inputs: { x: out }, attrs: { shape: x.shape }, backend });\n  backend.disposeData(out.dataId);\n  return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n  kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as {} as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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=====  
*  
\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';  
\nimport {BackendWasm} from './backend_wasm';  
\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number, numChannels: number, radians: number, centerX: number, centerY: number, fillBytes: Uint8Array, fillLength: number, outId: number) => void;  
\nfunction setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n    'number', // outId\n  ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs, backend: BackendWasm, attrs: RotateWithOffsetAttrs}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  const [centerX, centerY] = backend_util.getImageCenter(center, imageHeight, imageWidth);\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n  const fillValues = typeof fillValue === 'number' ? [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] : [...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n  wasmRotate(\n    imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX, centerY, fillBytes, fillValues.length, outId);\n  return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n  kernelName: RotateWithOffset, backendName: 'wasm', kernelFunc: rotateWithOffset as {} as KernelFunc, setupFunc: setup;\n};  
"/**  
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 */
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=====  
*  
\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';  
\nimport {createUnaryKernelConfig} from './unary_kernel';  
\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);  
"/**  
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 * limitations under the License.  
 */
```

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=====  
*  
\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';  
\nimport {createUnaryKernelConfig} from './unary_kernel';  
\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);  
"/**  
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```
=====
*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
 './types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n  'number', // indicesId\n  'number', // updatesId\n  'number', // dtype\n  'number', //
sliceRank\n  'number', // numUpdates\n  'number', // sliceSize\n  'array', // strides\n  'number', // outputSize\n
'number' // outId\n  ]);\n\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs}): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,
updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if
(util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,
outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =
backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData =
backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n\n    const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n
waswScatterNd(\n    indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n    sliceSize,
stridesBytes, outputSize, outId);\n\n    return out;\n  }\n\n  export const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: scatterNd as {} as
KernelFunc\n  };}\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n *
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=====
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,
offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n  'number', // conditionId\n  'number', // tId\n  'number', // eId\n
'number', // offset\n  'number', // outId\n  ]);\n\n  function select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n    const {inputs, backend} = args;\n    const {condition, t, e} = inputs;\n\n    const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId =
backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    const cRank = condition.shape.length;\n    const tRank =
t.shape.length;\n\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1 :\n    util.sizeFromShape(t.shape.slice(1));\n\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export
const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as {}
as KernelFunc,\n    setupFunc: setup\n  };}\n\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights
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```
=====\n\n*/\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\nTensorInfo {\n  const { backend, inputs: { x } } = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId);\n  return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from '../unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport { KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n    'number', // xId\n    'number', // outId\n    'number', // channels\n    'number' // batch\n  ]);\n}\n\nfunction softmax(\n  args: { backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs }):\nTensorInfo {\n  const { backend, inputs: { logits }, attrs: { dim } } =\n  args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape, logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n  const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*/\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
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SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {padV2Config} from
 './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction
 spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:
 SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,
 paddings} = attrs;\n  const prod = util.sizeFromShape(blockShape);\n  const completePaddings: Array<[number,
 number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n  for (let i = 1 +
 blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n  const paddedX =
 padV2Config.kernelFunc({\n    inputs: {x},\n    backend,\n    attrs: {paddings: completePaddings, constantValue:
 0}\n  }) as TensorInfo;\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape,
 blockShape, prod, false);\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
 reshapedPaddedShape.length, blockShape.length, false);\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n  const reshapeInputs:
 ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const
 paddedXReshaped =\n    reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n  const transposeInputs:
 TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n    TransposeAttrs = {perm:
 permutedReshapedPaddedPermutation};\n  const paddedXT =\n    transpose({inputs: transposeInputs, backend,
 attrs: transposeAttrs});\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const
 resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n  const result = reshape(\n    {inputs:
 resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n  backend.disposeData(paddedX.dataId);\n
 backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n  return
 result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName:
 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n"/**\n * @license\n *
 Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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 agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
 './backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n  args: {inputs: SplitVInputs,
 attrs: SplitVAttrs, backend: BackendWasm}) {\n  const {inputs, attrs, backend} = args;\n  const {x} = inputs;\n
 const {numOrSizeSplits, axis} = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes =
 backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n
 const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] =
 s;\n    const xSlice =\n      slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n    begin[$axis] += s;\n
 return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName:
 'wasm',\n  kernelFunc: splitV as {} as KernelFunc\n};\n"/**\n * @license\n *
 Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
 License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
 agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */

```

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=====\n
*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from

```

```
./unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}\n from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig\n =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo}\n from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmStep:\n (xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n 'number', // alpha\n 'number', // dtype\n 'number', // out_id\n ]);\n}\n\nfunction step(\n args: {\n backend:\n BackendWasm, inputs: StepInputs, attrs: StepAttrs\n }):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId,\n alpha, CCppType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName:\n Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n *\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,\n util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from\n './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,\n xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes:
```

```

Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
  'number', // xId\n  'array', // xStrides\n  'number', // xRank\n  'array', // beginBytes\n  'array', // endBytes\n  'array', // stridesBytes\n  'array', // outShapeBytes\n  'array', // outStridesBytes\n  'number', //
  outShapeLength\n  'number', // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n  inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n    sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n      newAxisMask, shrinkAxisMask);\n\n  let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},\n      backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
    memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
    rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n    // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},\n      backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:\n      finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
    backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const
    xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes
    = new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new
    Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n    const
    outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =
    new Uint8Array(\n      new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
    backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length,\n      beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n    result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n    backend.disposeData(out.dataId);\n  }\n\n  return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as { } as KernelFunc\n};\n\n"/**\n *
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  2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
  *\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
  './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n  createBinaryKernelConfig(Sub, supportsFullBroadcast);\n\n"/**\n *
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  2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
  *\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
  '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
  {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:

```

```

number, reduceSize: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n  'number', // input_id\n  'number', // reduce_size\n  'number', // dtype\n  'number', // out_id\n  ]);\n}\n\nfunction sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let
inputId = xId;\n  let input = x;\n  const {transposed, axes, originalAxes, inputWasTransposed} = \n
  permuteAxesAndTranspose(x, axis, backend);\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n  const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId !== xId) {\n  // transpose was
not a no-op. We will need to dispose of this\n  // once we are done.\n  input = transposed;\n  inputId =
transposedId;\n  reductionAxes = backend_util.getInnerMostAxes(\n  reductionAxes.length,
input.shape.length);\n  }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n  'sum', reductionAxes,
input.shape.length);\n  const [outShape, reduceShape] = \n
  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
  util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
  (util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n  if (inputWasTransposed) {\n  // dispose of
the transposed tensor.\n  backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n  // reshape\n  const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n  }\n  return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n\n"/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n\n"/**\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:

```



```

number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n  'number', // x_id\n  'array', // x_shape\n  'number', //
x_shape.length\n  'array', // new_shape\n  'number', // new_shape.length\n  'number' // out_id\n
]);\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n  CppDType[out.dtype], outId);\n  return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n  'number', // xId\n  'array', // x_shape\n  'number',
// x_shape.length\n  'number', // x.dtype\n  'number', // k\n  'bool', // sorted\n  'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n  wasmTopK(\n  xId, xShapeBytes, x.shape.length,
CppType[x.dtype], k, sorted,\n  outValuesId, outIndicesId);\n  return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: topk as {} as KernelFunc,\n};\n\n", /**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n  imageId:
number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:
number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)

```

```

=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,\n  null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n}\n\nfunction transform(\n  args:\n    { backend: BackendWasm, inputs: TransformInputs, attrs:\n      TransformAttrs }):\n  TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { image, transforms } = inputs;\n    const { interpolation, fillMode, fillValue, outputShape } = attrs;\n    const [batch, imageHeight, imageWidth,\n      numChannels] = image.shape;\n    const [outHeight, outWidth] =\n      outputShape != null ? outputShape :\n      [imageHeight, imageWidth];\n    const outShape =\n      [batch, outHeight, outWidth,\n        numChannels] as\n      [number, number, number, number];\n    const strides =\n      new Uint8Array(new\n      Int32Array(util.computeStrides(image.shape)).buffer);\n\n    const out = backend.makeOutput(outShape,\n      image.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const imageData =\n      backend.dataIdMap.get(image.dataId);\n    const imageId = imageData.id;\n\n    const transformsData =\n      backend.dataIdMap.get(transforms.dataId);\n    const transformsId = transformsData.id;\n\n    const\n      interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n    let fillModeId;\n    switch (fillMode) {\n      case 'constant':\n        fillModeId = 1;\n        break;\n      case 'reflect':\n        fillModeId = 2;\n        break;\n      case 'wrap':\n        fillModeId = 3;\n        break;\n      case 'nearest':\n        fillModeId = 4;\n        break;\n      default:\n        fillModeId = 1;\n    }\n    break;\n  }\n\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n    outWidth, numChannels, imageWidth, imageHeight, strides,\n    image.shape.length - 1, interpolationModeId,\n    fillModeId, fillValue,\n    outId);\n\n  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as {} as\n  KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

```

```

=====\n
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { slice } from\n './Slice';\n\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n    const { inputs, backend, attrs } = args;\n    const { value } = inputs;\n    let { axis } = attrs;\n\n    if (axis <\n      0) {\n      axis += value.shape.length;\n    }\n\n    const numOutputs = value.shape[axis];\n    const rank =\n      value.shape.length;\n    const outShape: number[] = new Array(rank - 1);\n    let outIndex = 0;\n    for (let i = 0; i < rank;\n      i++) {\n      if (i !== axis) {\n        outShape[outIndex++] = value.shape[i];\n      }\n    }\n\n    const outs: TensorInfo[] = new\n      Array(numOutputs);\n    const begin = new Array(rank).fill(0);\n    const size = value.shape.slice();\n    size[axis] = 1;\n    for (let i = 0; i < outs.length; i++) {\n      begin[axis] = i;\n      outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },\n        backend});\n    }\n\n    return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n  }\n\n  export const\n    unpackConfig: KernelConfig = {\n      kernelName: Unpack,\n      backendName: 'wasm',\n      kernelFunc: unpack as {} as\n      KernelFunc\n    };\n\n  "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as { } as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are
needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig}
from './kernels/_FusedMatMul';\n\nimport {absConfig} from './kernels/Abs';\n\nimport {addConfig} from
 './kernels/Add';\n\nimport {addNConfig} from './kernels/AddN';\n\nimport {allConfig} from './kernels/All';\n\nimport
{anyConfig} from './kernels/Any';\n\nimport {argMaxConfig} from './kernels/ArgMax';\n\nimport {avgPoolConfig}
from './kernels/AvgPool';\n\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\n\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\n\nimport {castConfig} from './kernels/Cast';\n\nimport
{ceilConfig} from './kernels/Ceil';\n\nimport {clipByValueConfig} from './kernels/ClipByValue';\n\nimport
{concatConfig} from './kernels/Concat';\n\nimport {conv2DConfig} from './kernels/Conv2D';\n\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\n\nimport {cosConfig} from
 './kernels/Cos';\n\nimport {coshConfig} from './kernels/Cosh';\n\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\n\nimport {cumsumConfig} from './kernels/Cumsum';\n\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\n\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\n\nimport {eluConfig} from './kernels/Elu';\n\nimport {equalConfig} from
 './kernels/Equal';\n\nimport {expConfig} from './kernels/Exp';\n\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\n\nimport {fillConfig} from './kernels/Fill';\n\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\n\nimport {floorConfig} from './kernels/Floor';\n\nimport {floorDivConfig} from
 './kernels/FloorDiv';\n\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\n\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\n\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\n\nimport {gatherNdConfig} from './kernels/GatherNd';\n\nimport
{gatherV2Config} from './kernels/GatherV2';\n\nimport {greaterConfig} from './kernels/Greater';\n\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\n\nimport {identityConfig} from './kernels/Identity';\n\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\n\nimport {lessConfig} from './kernels/Less';\n\nimport
{lessEqualConfig} from './kernels/LessEqual';\n\nimport {logConfig} from './kernels/Log';\n\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\n\nimport {maxConfig} from './kernels/Max';\n\nimport
{maximumConfig} from './kernels/Maximum';\n\nimport {maxPoolConfig} from './kernels/MaxPool';\n\nimport
{meanConfig} from './kernels/Mean';\n\nimport {minConfig} from './kernels/Min';\n\nimport {minimumConfig} from
 './kernels/Minimum';\n\nimport {mirrorPadConfig} from './kernels/MirrorPad';\n\nimport {multiplyConfig} from
 './kernels/Multiply';\n\nimport {negConfig} from './kernels/Neg';\n\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\n\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\n\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\n\nimport {notEqualConfig} from './kernels/NotEqual';\n\nimport {oneHotConfig}
from './kernels/OneHot';\n\nimport {onesLikeConfig} from './kernels/OnesLike';\n\nimport {packConfig} from

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./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
./kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
./kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n  0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n  2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,

```

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11\n  ]));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag("WASM_HAS_MULTITHREAD_SUPPORT", async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n ]));\n } catch (e) {\n return false;\n }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object\";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function\";ENVIRONMENT_IS_NODE=typeof process==="object\"&&typeof
process.versions==="object\"&&typeof
process.versions.node==="string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer\"}var scriptDirectory=\"\";function
locateFile(path){if(Module["locateFile\"]){return Module["locateFile\"}(path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"^\"}else{scriptDirectory=__dirname+\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=
nodePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\g,\"^\"}arguments_=process[\"arg

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v\].slice(2);process["on"](\("uncaughtException",function(ex){if(!ex instanceof ExitStatus)){throw
ex}});process["on"](\("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\("worker_threads"))}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?);throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=="undefined"&&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\("blob:\")!=="0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\("^")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\("fs");if(!nodePath)nodePath=require(\("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require(\("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"]arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"]wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort(\("no native wasm
support detected"))}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\("Assertion failed: "+text))}function getCFunc(ident){var
func=Module["_" + ident];assert(func,\("Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var

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len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx
x++]&63;if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAt(++i)&1023);if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new
Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new
Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new
Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new
Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module[\"wasmMemory\"]};buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=
Module[\"wasmMemory\"]}else{wasmMemory=new
WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not

```

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have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch=="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}return Promise.resolve().then(function(){return

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getBinary(wasmBinaryFile)})function createWasm(){ var info={"a":asmLibraryArg};function
receiveInstance(instance,module){ var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIROMENT_IS_PTHREAD){ var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency("\wasm-
instantiate\");}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("\wasm-instantiate\");}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"]);}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err("\failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\function"){return fetch(wasmBinaryFile,{credentials:\same-
origin\}).then(function(response){ var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\wasm streaming compile failed: "+reason);err("\falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{ var
exports=Module["instantiateWasm"](info,receiveInstance);return exports }catch(e){err("\Module.instantiateWasm
callback failed with error: "+e);return false }}instantiateAsync().catch(Promise.reject);return{ }}var
ASM_CONSTS={10520:function(){throw\Canceled!"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0})};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){ var callback=callbacks.shift();if(typeof
callback===\function"){callback(Module);continue }var func=callback.func;if(typeof
func===\number"){if(callback.arg===undefined){wasmTable.get(func())}else{wasmTable.get(func)(callback.arg
)}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){ var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh

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readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\'+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\\\": \"cancel\\\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){ GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)} }var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){ var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()} },initRuntime:function(){ var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emscripten_register_main_browser_thread_id(tb);initWorker:function(){ },t
hreadExitHandlers:[],setThreadStatus:function(){ },runExitHandlers:function(){ while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop();if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors();runExitHandlersAndDeinitThread:function(tb,exitCode){ Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){ var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\\\": \"exit\\\"})}} },threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\\\": \"cancelDone\\\"})},terminateAllThreads:function(){for(var t in
PThread.threads){ var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.threads={ };for(var i=0;i<PThread.unusedWorkers.length;++i){ var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){ var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){ if(!pthread)return;if(pthread.threadInfoStruct){ var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null },returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){ delete
PThread.threads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker

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s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined));,runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[_emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[_emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=$_pthread_self()){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+' to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d["thread"]);}else
if(cmd===\"killThread\"){killThread(d["thread"]);}else
if(cmd===\"cancelThread\"){cancelThread(d["thread"]);}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d["threadId"]+\":
\'+d["text"]);}else if(cmd===\"printErr\"){err(\"Thread \"+d["threadId"]+\": \'+d["text"]);}else
if(cmd===\"alert\"){alert(\"Thread \"+d["threadId"]+\": \'+d["text"]);}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\"exitProcess\"){try{exit(d["returnCode"]);}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\'+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \'+e.filename+\":'+e.lineno+\":
\'+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\":\"load\", \"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]|_scriptDir,\"wasmMemory\":wasmMe
memory,\"wasmModule\":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-
backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\"Assertion failed: \'+UTF8ToString(condition)+'\", at:
\'+[filename?UTF8ToString(filename):\"unknown filename\"],line,func?UTF8ToString(func):\"unknown
function\")}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof

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dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({"cmd\":"processQueuedMainThreadWork"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread\":targetThreadId,"cmd\":"processThreadQueu
e"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd\":"processThreadQueue"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret==="timed-out")return-
73;if(ret==="not-equal")return-6;if(ret==="ok")return 0;throw"Atomics.wait returned an unexpected value
"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var

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maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}},function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return

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cString}function
_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;_emsripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emsripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emsripten_set_current_thread_status(newStatus){}function
_emsripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ctx["vertexAttribDivisor"]=function(index,divisor){ex
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1}}function

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__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("\WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source="\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext("\webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\undefined\||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("\lose_context\")<0&&ext.inde
xOf("\debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\)\"){name=name.slice(0,name.lastIndexOf("\["))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\["+j+"\]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\default\,\low-power\,\high-performance\];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\preserveDrawingBuffer\":!!GROWABLE_HEAP_

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I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)];var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread()
can only ever be called from main application thread!\";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal
error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread
ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_
ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={\"cmd\":,\"run\":,\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":thre
adParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthrea
d=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return

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6}if(!pthread_ptr){err("\pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emsripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==(0)}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw"Canceled!"}function
_emsripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread")}function
__emsripten_do_pthread_join(thread,status,block){if(!thread){err("\pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err("\PThread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emsripten_main_browser_thread_id()===thread){err("\Main thread
\"+thread+\" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!===thread){err("\pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("\Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emsripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emsripten_main_thre
ad_process_queued_calls();_emsripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emsripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case

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49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]|1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu

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le["asm"]["Q"].apply(null,arguments);var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["R"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"]["S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["T"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"]["U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["l

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"ma").apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"za"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"Ka"]).apply(null,arguments)};var

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ents});var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"]["La"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"]["Ma"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"]["Na"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"]["Oa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"]["Pa"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"]["Qa"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"]["Ra"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"]["Sa"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"]["Ta"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"]["Ua"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Va"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Wa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Xa"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"]["Ya"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Za"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["_a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["$a"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["ab"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["bb"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["cb"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["db"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["eb"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["fb"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["g

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b\").apply(null,arguments));var
__FusedMatMul=Module[\"__FusedMatMul"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul"]=
Module[\"asm\"][\"hb\"]).apply(null,arguments));var
_malloc=Module[\"_malloc"]=function(){return(_malloc=Module[\"_malloc"]=Module[\"asm\"][\"ib\"]).apply(nul
l,arguments));var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free"]=Module[\"asm\"][\"jb\"]).apply(null,arguments
)};var
__errno_location=Module[\"__errno_location"]=function(){return(__errno_location=Module[\"__errno_locati
on\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments));var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global
_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments));var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"as
m\"][\"mb\"]).apply(null,arguments));var
__pthread_tsd_run_dtors=Module[\"__pthread_tsd_run_dtors\"]=function(){return(__pthread_tsd_run_dtors=Mod
ule[\"__pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments));var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments));var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=
function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments));var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments));var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments));var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__ems
cripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments));var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
\"][\"tb\"]).apply(null,arguments));var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments));var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments));var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscri
pten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments));var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments));var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments));var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\
\"][\"zb\"]).apply(null,arguments));var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\
\"]).apply(null,arguments));var

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__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=function(){return(__emscripten_stack_set_
limits=Module["__emscripten_stack_set_limits"]=Module["asm\"][["Bb\"]).apply(null,arguments)};var
__memalign=Module["__memalign"]=function(){return(__memalign=Module["__memalign"]=Module["asm\"][["Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module["__emscripten_allow_main_runtime_queued_calls"]=1
0512;var
__emscripten_main_thread_futex=Module["__emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](""),1);doRun()},1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n\n);)\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =
WasmBackendModuleThreadedSimd;\n", "\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!="undefined"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram="./this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return

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scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"^\"}else{scriptDirectory=__dirname+\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=
nodePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\/g,\"^\"))arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\")read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\")return new
Uint8Array(readbuffer(f))data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\")arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\")arguments_=arguments;if(typeof
quit===\"function\")quit_=function(status){quit(status)}if(typeof print!=\"undefined\")if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print} else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"^\"+1)}else{scriptDirectory=\"\"}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} else{ }var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\")abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str===null&&str!=\"undefined\"&&str!=\"0\")var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var

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converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type==="number"});var numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++] =u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++] =192|u>>6;heap[outIdx++] =128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++] =224|u>>12;heap[outIdx++] =128|u>>6&63;heap[outIdx++] =128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++] =240|u>>18;heap[outIdx++] =128|u>>12&63;heap[outIdx++] =128|u>>6&63;heap[outIdx++] =128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function preRun(){if(Module["preRun"]){if(typeof Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){addOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].length){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function

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addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
dependencies"]}(runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"]}(runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"]}(what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function

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emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n

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ull,arguments));var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["s"]).apply(null,arguments
)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"]["t"]).apply(null,argument
s)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"]["u"]).apply(null,ar
guments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["v"]).apply(null,arguments);
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["w"]).apply(null,argumen
ts)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["x"]).app
ly(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["y"]).a
pply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"]["z"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["A"]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module[
"asm"]["B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["C"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modu
le["_Conv2DBackpropInput"]=Module["asm"]["D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["E"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["F"]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=
Module["asm"]["G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).a
pply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arg
uments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,argument
s)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modu
le["asm"]["N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,argu
ments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).

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apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["_asm\"][["Q"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["_asm\"][["R"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["_asm\"][["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["_asm\"][["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["_asm\"][["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["_asm\"][["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["_asm\"][["W"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["_asm\"][["X"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["_asm\"][["Y"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["_asm\"][["Z"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["_asm\"][["_"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["_asm\"][["$"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["_asm\"][["aa"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["_asm\"][["ba"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["_asm\"][["ca"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["_asm\"][["da"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["_asm\"][["ea"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["_asm\"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["_asm\"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["_asm\"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["_asm\"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["_asm\"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["_asm\"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["_asm\"][["la"]]).apply(null,arguments)};var

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ule["_NonMaxSuppressionV5"]=Module["_asm"]["_la"].apply(null,arguments);var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["_asm"]["_ma"]
).apply(null,arguments);var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["_asm"]["_na"]).appl
y(null,arguments);var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["_asm"]["_oa"]).apply(nul
l,arguments);var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["_asm"]["_pa"]).apply(null,argume
nts);var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["_asm"]["_qa"]).apply(null,argu
ments);var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["_asm"]["_ra"]).apply(null,argum
ents);var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["_asm"]["_sa"]).app
ly(null,arguments);var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["_asm"]["_ta"]).apply(null,argume
nts);var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["_asm"]["_ua"]).apply(null,ar
guments);var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Mo
dule["_asm"]["_va"]).apply(null,arguments);var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["_asm"]["_wa"]).app
ly(null,arguments);var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["_asm"]["_xa"]).apply(null,arguments);var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["_asm"]["_ya"]).apply(nul
l,arguments);var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["_asm"]["_za"]).apply(null,arg
uments);var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["_asm"]["_Aa
"]).apply(null,arguments);var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["_asm"]["_Ba"]
).apply(null,arguments);var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["_asm"]["_Ca"]).ap
ply(null,arguments);var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["_asm"]["_Da"]).apply(null,arguments
);var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["_asm"]["_Ea"]).ap
ply(null,arguments);var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["_asm"]["_Fa"]).apply(null,argumen
ts);var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["_asm"]["_Ga"]).apply(nu
ll,arguments);var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["_asm"]["_Ha"]).apply(null,arguments);var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["_asm"]["_Ia"]).apply(null,argume
nts);var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["_as

```

```

m\"][\`Ja\"]).apply(null,arguments)};var
_Sub=Module[\`_Sub\"]=function(){return(_Sub=Module[\`_Sub\"]=Module[\`asm\"][\`Ka\"]).apply(null,arguments)};var
_Sum=Module[\`_Sum\"]=function(){return(_Sum=Module[\`_Sum\"]=Module[\`asm\"][\`La\"]).apply(null,arguments)};var
_Tan=Module[\`_Tan\"]=function(){return(_Tan=Module[\`_Tan\"]=Module[\`asm\"][\`Ma\"]).apply(null,arguments)};var
_Tanh=Module[\`_Tanh\"]=function(){return(_Tanh=Module[\`_Tanh\"]=Module[\`asm\"][\`Na\"]).apply(null,arguments)};var
_Tile=Module[\`_Tile\"]=function(){return(_Tile=Module[\`_Tile\"]=Module[\`asm\"][\`Oa\"]).apply(null,arguments)};var
_TopK=Module[\`_TopK\"]=function(){return(_TopK=Module[\`_TopK\"]=Module[\`asm\"][\`Pa\"]).apply(null,arguments)};var
_Transform=Module[\`_Transform\"]=function(){return(_Transform=Module[\`_Transform\"]=Module[\`asm\"][\`Qa\"]).apply(null,arguments)};var
_Transpose=Module[\`_Transpose\"]=function(){return(_Transpose=Module[\`_Transpose\"]=Module[\`asm\"][\`Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\`__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\`__FusedMatMul\"]=Module[\`asm\"][\`Sa\"]).apply(null,arguments)};var
_malloc=Module[\`_malloc\"]=function(){return(_malloc=Module[\`_malloc\"]=Module[\`asm\"][\`Ta\"]).apply(null,arguments)};var
_free=Module[\`_free\"]=function(){return(_free=Module[\`_free\"]=Module[\`asm\"][\`Ua\"]).apply(null,arguments)};var
___errno_location=Module[\`___errno_location\"]=function(){return(___errno_location=Module[\`___errno_location\"]=Module[\`asm\"][\`Va\"]).apply(null,arguments)};var
stackSave=Module[\`stackSave\"]=function(){return(stackSave=Module[\`stackSave\"]=Module[\`asm\"][\`Wa\"]).apply(null,arguments)};var
stackRestore=Module[\`stackRestore\"]=function(){return(stackRestore=Module[\`stackRestore\"]=Module[\`asm\"][\`Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\`stackAlloc\"]=function(){return(stackAlloc=Module[\`stackAlloc\"]=Module[\`asm\"][\`Ya\"]).apply(null,arguments)};Module[\`cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=`ExitStatus`;this.message=`Program terminated with
exit(\`+status+\`)\`;this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\`calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\`onRuntimeInitialized\"])Module[\`onRuntimeInitialized\"]();postRun(
)}if(Module[\`setStatus\"]){Module[\`setStatus\"](\`Running...\`);setTimeout(function(){setStatus(function(){Module[\`setStatus\"](\`)\`),1);doRun()},1)}else{doRun()}}Module[\`run\"]=run;if(Module[\`preInit\"]){if(typeof
Module[\`preInit\`]===\`function\`)Module[\`preInit\`]=[Module[\`preInit\"]];while(Module[\`preInit\"].length>0){
Module[\`preInit\"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define[\'amd\'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\`WasmBackendModule\`] = WasmBackendModule;\n",`/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the `License`);\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at*\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

```
=====
\n
*\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount:
number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap:
DataStorage<TensorData>;\n\n  constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n    DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return
this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start =
util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n    dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n    dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n      dataId,\n      {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size *
util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n        new Uint8Array(\n          (values
as backend_util.TypedArray).buffer,\n          (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return
this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset,
dtype, shape, stringBytes} =\n    this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n
}\n    const bytes = this.wasm.HEAPU8.slice(\n      memoryOffset,\n      memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false
otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n
disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =
this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n
}\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =
this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n
const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision():
32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n
getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n
this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:
false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this
```



```

method allocates memory on the WASM heap. If `memoryOffset` is present, the memory was allocated
elsewhere (in c++) and we just record the pointer where that memory lives.

makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):
TensorInfo {
  let dataId: {};
  if (memoryOffset
== null) {
    dataId = this.write(null /* values */, shape, dtype);
  } else {
    const id =
this.dataIdNextNumber++;
    dataId = {id};
    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});
    const size = util.sizeFromShape(shape);
    this.wasm.tfjs.registerTensor(id, size,
memoryOffset);
  }
  return {dataId, shape, dtype};
}

typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):
backend_util.TypedArray {
  const buffer = this.wasm.HEAPU8.buffer;
  const
{memoryOffset} = this.dataIdMap.get(dataId);
  const size = util.sizeFromShape(shape);
  switch (dtype) {
  case 'float32':
    return new Float32Array(buffer, memoryOffset, size);
  case 'int32':
    return new
Int32Array(buffer, memoryOffset, size);
  case 'bool':
    return new Uint8Array(buffer, memoryOffset,
size);
  default:
    throw new Error(`Unknown dtype ${dtype}`);
  }
}

function
createInstantiateWasmFunc(path: string) {
  // this will be replace by rollup plugin patchWechatWebAssembly in
// miniprogram's output.
  // tslint:disable-next-line:no-any
  return (imports: any, callback: any) => {
    util.fetch(path, {credentials: 'same-origin'}).then((response) => {
      if (!response['ok']) {
        imports.env.a(`failed to load wasm binary file at '${path}'`);
      }
      response.arrayBuffer().then(binary => {
        WebAssembly.instantiate(binary, imports).then(output => {
          callback(output.instance, output.module);
        });
      });
    });
    return {};
  };
}

Returns the path of the WASM binary.
@param
simdSupported whether SIMD is supported
@param threadsSupported whether multithreading is supported
@param wasmModuleFolder the directory containing the WASM binaries.

function getPathToWasmBinary(
  simdSupported: boolean, threadsSupported: boolean,
  wasmModuleFolder: string) {
  if (wasmPath != null) {
    // If wasmPath is defined, the user has supplied a full path to
    // the vanilla .wasm binary.
    return
wasmPath;
  }
  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';
  if (simdSupported &&
threadsSupported) {
    path = 'tfjs-backend-wasm-threaded-simd.wasm';
  } else if (simdSupported) {
    path =
'tfjs-backend-wasm-simd.wasm';
  }
  if (wasmFileMap != null) {
    if (wasmFileMap[path] != null) {
      return
wasmFileMap[path];
    }
  }
  return wasmModuleFolder + path;
}

Initializes the wasm
module and creates the js <--> wasm bridge.
NOTE: We wrap the wasm module in a object with property
'wasm' instead of
returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested
in
Chrome 76).
export async function init(): Promise<{wasm: BackendWasmModule}> {
  const
[simdSupported, threadsSupported] = await Promise.all([
    env().getAsync('WASM_HAS_SIMD_SUPPORT'),
    env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')
  ]);
  return new Promise((resolve, reject) => {
    const factoryConfig: WasmFactoryConfig = {};
    /**
     * This function overrides the Emscripten
module locateFile utility.
     * @param path The relative path to the file that needs to be loaded.
     * @param
prefix The path to the main JavaScript file's directory.
     */
    factoryConfig.locateFile = (path, prefix) => {
      if (path.endsWith('.worker.js')) {
        const response = wasmWorkerContents;
        const blob = new
Blob([response], {type: 'application/javascript'});
        return URL.createObjectURL(blob);
      }
      if
(path.endsWith('.wasm')) {
        return getPathToWasmBinary(
          simdSupported as boolean,
          threadsSupported as boolean,
          wasmPathPrefix != null ? wasmPathPrefix : prefix);
      }
      return prefix
+ path;
    };
    // Use the instantiateWasm override when system fetch is not available.
    // Reference:
    // https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170
    if (customFetch) {
      factoryConfig.instantiateWasm =
createInstantiateWasmFunc(getPathToWasmBinary(
          simdSupported as boolean, threadsSupported as
boolean,
          wasmPathPrefix != null ? wasmPathPrefix : ''));
    }
    let initialized = false;
    factoryConfig.onAbort = () => {
      if (initialized) {
        // Emscripten already called console.warn so no need to
double log.
        return;
      }
      if (initAborted) {
        // Emscripten calls `onAbort` twice, resulting in double
error
        // messages.
        return;
      }
      initAborted = true;
      const rejectMsg =
'Make sure the
server can serve the `wasm` file relative to the ' +
'bundled js file. For more details see

```

```

https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers;\n
reject({message: rejectMsg});\n
};\n\n
let wasm: Promise<BackendWasmModule>;\n
// If `wasmPath` has been defined we must initialize the vanilla module.\n
if (threadsSupported && simdSupported && wasmPath === null) {\n
  factoryConfig.mainScriptUrlOrBlob = new Blob([\n
    `var WasmBackendModuleThreadedSimd = ` +\n
    `wasmFactoryThreadedSimd.toString()`,\n
    {type: 'text/javascript'}];\n
  wasm =\n
  wasmFactoryThreadedSimd(factoryConfig);\n
} else {\n
  // The wasmFactory works for both vanilla and SIMD binaries.\n
  wasm = wasmFactory(factoryConfig);\n
}\n\n
// The WASM module has been successfully created by the factory.\n
// Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n
  initialized = true;\n
  initAborted = false;\n\n
  const voidReturnType: string = null;\n
  // Using the tfjs namespace to avoid conflict with emscripten's API.\n
  module.tfjs = {\n
    init: module.cwrap('init', null, []),\n
    initWithThreadsCount: module.cwrap('init_with_threads_count', null, ['number']),\n
    getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n
    registerTensor: module.cwrap([\n
      'register_tensor', null, [\n
        'number', // id\n
        'number', // size\n
        'number', // memoryOffset\n
      ]],\n
      disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n
      dispose: module.cwrap('dispose', voidReturnType, []),\n
    };\n\n
    resolve({wasm: module});\n
  });\n
});\n\n
function typedArrayFromBuffer(buffer: ArrayBuffer, dtype: DataType):\n
backend_util.TypedArray {\n
  switch (dtype) {\n
    case 'float32':\n
      return new Float32Array(buffer);\n
    case 'int32':\n
      return new Int32Array(buffer);\n
    case 'bool':\n
      return new Uint8Array(buffer);\n
    default:\n
      throw new Error(`Unknown dtype ${dtype}`);\n
  }\n
}\n\n
const wasmBinaryNames = ['tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm', 'tfjs-backend-wasm-threaded-simd.wasm'] as const;\n
type WasmBinaryName = typeof wasmBinaryNames[number];\n\n
let wasmPath: string = null;\n
let wasmPathPrefix: string = null;\n
let wasmFileMap: {[key in WasmBinaryName]?: string} = {};\n
let initAborted = false;\n
let customFetch = false;\n\n
/**\n
 * @deprecated Use `setWasmPaths` instead.\n
 * Sets the path to the `.wasm` file which will be fetched when the wasm\n
 * backend is initialized. See\n
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n
 * for more details.\n
 * @param path wasm file path or url\n
 * @param usePlatformFetch optional boolean to use platform fetch to download\n
 * the wasm file, default to false.\n
 */\n
/**\n
 * @doc {heading: 'Environment', namespace: 'wasm'}\n
 */\n
export function setWasmPath(path: string, usePlatformFetch = false): void {\n
  deprecationWarn(\n
    'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n
    ' will be removed in a future release.);\n
  if (initAborted) {\n
    throw new Error(\n
      'The WASM backend was already initialized. Make sure you call ' +\n
      '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n
  }\n
  wasmPath = path;\n
  customFetch = usePlatformFetch;\n
}\n\n
/**\n
 * Configures the locations of the WASM binaries.\n
 */\n
export function setWasmPaths({\n
  * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n
  * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n
  * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n
} *);\n
tf.setBackend('wasm');\n\n
/**\n
 * @param prefixOrFileMap This can be either a string or object:\n
 * - (string) The path to the directory where the WASM binaries are located.\n
 * Note that this prefix will be used to load each binary (vanilla,\n
 * SIMD-enabled, threading-enabled, etc.).\n
 * - (object) Mapping from names of WASM binaries to custom\n
 * full paths specifying the locations of those binaries. This is useful if\n
 * your WASM binaries are not all located in the same directory, or if your\n
 * WASM binaries have been renamed.\n
 * @param usePlatformFetch optional boolean to use platform fetch to download\n
 * the wasm file, default to false.\n
 */\n
/**\n
 * @doc {heading: 'Environment', namespace: 'wasm'}\n
 */\n
export function setWasmPaths(prefixOrFileMap: string | {[key in WasmBinaryName]?: string},\n
  usePlatformFetch = false): void {\n
  if (initAborted) {\n
    throw new Error(\n
      'The WASM backend was already initialized. Make sure you call ' +\n
      '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n
      '`tf.ready()`);\n
  }\n\n
  if (typeof prefixOrFileMap === 'string') {\n
    wasmPathPrefix = prefixOrFileMap;\n
  } else {\n
    wasmFileMap = prefixOrFileMap;\n
    const missingPaths =\n
    wasmBinaryNames.filter(name => wasmFileMap[name] === null);\n
    if (missingPaths.length > 0) {\n
      throw new Error(\n
        `There were no entries found for the following binaries: ` +\n
        `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n
        `map providing a path for each binary, or with a string indicating ` +\n

```

```

`the directory where all the binaries can be found.`);
}
}
customFetch = usePlatformFetch;
}
}
**
Used in unit tests.
*/
export function resetWasmPath(): void {
  wasmPath = null;
  wasmPathPrefix = null;
  wasmFileMap = {};
  customFetch = false;
  initAborted = false;
}
}
}
let threadsCount = -1;
let actualThreadsCount = -1;
**
* Sets the number of threads that will be used by XNNPACK to create
* threadpool (default to the number of logical CPU cores).
*
* This must be called before calling
`tf.setBackend('wasm')`.
*/
export function setThreadsCount(numThreads: number) {
  threadsCount = numThreads;
}
}
}
**
* Gets the actual threads count that is used by XNNPACK.
*
* It is set after the backend is initialized.
*/
export function getThreadsCount(): number {
  if (actualThreadsCount === -1) {
    throw new Error(`WASM backend not initialized.`);
  }
  return actualThreadsCount;
}
}
}
export const
wasmWorkerContents = `var Module={};function threadPrintErr(){var
text=Array.prototype.slice.call(arguments).join(" ");console.error(text)}function threadAlert(){var
text=Array.prototype.slice.call(arguments).join("
");postMessage({cmd:"alert",text:text,threadId:Module["_pthread_self]()})}var
err=threadPrintErr,this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd==="load"){Module["wasmModule"]=e.data.wa
smModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;
Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof
e.data.urlOrBlob==="string"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)
}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})else
if(e.data.cmd==="objectTransfer"){Module["PThread"].receiveObjectTransfer(e.data)}else
if(e.data.cmd==="run"){Module["__performance_now_clock_drift"]=performance.now()-
e.data.time;Module["__emscripten_thread_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["_emscripten_tls_init"]
);Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self
"](),1);try{var
result=Module["invokeEntryPoint"](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module[
"PThread"].threadExit(result)}catch(ex){if(ex==="Canceled!"){Module["PThread"].threadCancel()}else
if(ex!="unwind"){if(ex instanceof
Module["ExitStatus"]){if(Module["getNoExitRuntime"]()){}}else{Module["PThread"].threadExit(ex.status)}}el
se{Module["PThread"].threadExit(-2);throw ex}}}}else
if(e.data.cmd==="cancel"){if(Module["_pthread_self"]()){Module["PThread"].threadCancel()}else
if(e.data.target==="setimmediate"){}}else
if(e.data.cmd==="processThreadQueue"){if(Module["_pthread_self"]()){Module["_emscripten_current_thread_
process_queued_calls"]()}else{err("worker.js received unknown command
"+e.data.cmd);err(e.data)}}catch(ex){err("worker.js onmessage() captured an uncaught exception:
"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process==="object"&&typeof
process.versions==="object"&&typeof process.versions.node==="string"){self={location:{href:__filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require("worker_threads");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on("message",function(data){onmessage({data:data})});var
nodeFS=require("fs");var nodeRead=function(filename){return nodeFS.readFileSync(filename,"utf8")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance==="undefined"){performance={now:function(){return Date.now()}}};";
**
* @license

```

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```
=====
*/
import './flags_wasm';
import {registerBackend} from '@tensorflow/tfjs-core';
import {BackendWasm,
init} from './backend_wasm';
export {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';
export {version as version_wasm} from './version';
const
WASM_PRIORITY = 2;
registerBackend('wasm', async () => {
  const {wasm} = await init();
  return new
BackendWasm(wasm);
}, WASM_PRIORITY);
/** @license See the LICENSE file.
*/
// This code is
auto-generated, do not modify this file!
const version = '3.11.0';
export
{version};
}, "names": ["CppType", "FusableActivation", "wasmFusedMatMul", "fusedMatMulConfig", "kernelName", "_FusedMatMul", "backendName", "setupFunc", "backend", "wasm", "cwrap", "kernelFunc", "args", "inputs", "attrs", "a", "b", "bias", "preluActivationWeights", "dtype", "Error", "transposeA", "transposeB", "activation", "leakyreluAlpha", "aId", "dataIdMap", "get", "dataId", "id", "bId", "biasId", "biasData", "shape", "length", "preluActivationWeightsId", "fuseActivation", "leftDim", "rightDim", "batchDim", "out", "makeOutput", "outId", "aShapeBytes", "Uint8Array", "Int32Array", "buffer", "bShapeBytes", "createUnaryKernelConfig", "outType", "wasmFunc", "x", "xId", "util", "sizeFromShape", "absConfig", "Abs", "createBinaryKernelConfig", "supportsFullBroadcast", "outputType", "newShape", "backend_util", "assertAndGetBroadcastShape", "aBroadcastDims", "getBroadcastDims", "bBroadcastDims", "loopsOverAllOfA", "every", "v", "i", "loopsOverAllOfB", "addConfig", "Add", "addNConfig", "AddN", "inputIds", "map", "inputIdsBytes", "identity", "inVals", "typedArrayFromHeap", "set", "identityConfig", "Identity", "wasmTranspose", "transpose", "reducedShape", "perm", "newPerm", "push", "minValIdx", "j", "removeOneSizeDims", "permIsNoOp", "outShape", "inShape", "Array", "computeOutShape", "cloned", "permBytes", "xShapeBytes", "transposeConfig", "Transpose", "permuteAxesAndTranspose", "axis", "xShape", "xRank", "originalAxes", "parseAxisParam", "axes", "permutedAxes", "getAxesPermutation", "xTransposed", "inputWasTransposed", "getInnerMostAxes", "transposed", "wasmAll", "allConfig", "All", "keepDims", "inputId", "input", "inputRank", "assertAxesAreInnerMostDims", "reduceShape", "computeOutAndReduceShapes", "reduceSize", "disposeData", "expandShapeToKeepDim", "wasmAny", "anyConfig", "Any", "argMaxConfig", "ArgMax", "transposedId", "slice", "outerSize", "innerSize", "wasmAvgPool", "avgPoolConfig", "AvgPool", "filterSize", "strides", "pad", "dimRoundingMode", "convInfo", "computePool2DInfo", "filterHeight", "filterWidth", "padTop", "padInfo", "top", "padRight", "right", "padBottom", "bottom", "padLeft", "left", "strideHeight", "strideWidth", "channels", "inChannels", "dataFormat", "dilationWidth", "dilationHeight", "reshape", "xSize", "$shape", "inferFromImplicitShape", "assert", "incRef", "reshapeConfig", "Reshape", "wasmBatchMatMul", "batchMatMulConfig", "BatchMatMul", "aRank", "bRank", "innerShapeA", "innerShapeB", "outerShapeA", "outerShapeB", "outerDimsA", "outerDimsB", "batchDimA", "batchDimB", "batchDimsCompatible", "concat", "b3dShape", "a3d", "b3d", "a3dId", "b3dId", "Math", "max", "sliceImpl", "vals", "begin", "size", "isContinuous", "slice_util", "isSliceContinuous", "xStrides", "computeStrides", "flatOffset", "computeFlatOffset", "subarray", "decodedData", "fromUint8ToStringArray", "inBuf", "outBuf", "outLoc", "indexToLoc", "inLoc", "idx", "fromStringArrayToUint8", "values", "begin_", "size_", "parseSliceParams", "xVals", "readSync", "outData", "stringBytes", "res", "sliceImplCPU", "outVals", "rank", "xStride", "outOffset", "beginI", "beginJ", "endI", "xOffset", "slice2d", "xStride1", "xStride2", "beginK", "endJ", "slice3d", "xStride3", "endK", "beginL", "k", "slice4d", "sliceConfig", "Slice", "batchToSpaceNDConfig", "BatchToSpaceND", "blockShape", "crops", "prod", "reduce", "reshaped", "getReshaped", "permuted", "getPermuted", "reshapedPermuted", "getReshapedPermuted", "sliceBeginCoords", "getSliceBeginCoords", "sliceSize", "getSliceSize", "xReshaped", "result", "cast", "castConfig", "Cast", "ceilConfig", "Ceil", "wasmClip", "clipByValueConfig", "ClipByValue", "clipValueMin", "clipValueMax", "t", "$inputs", "filter", "shapes", "assertParamsConsistent", "inputs2D", "inputsValShapes", "simplyConcat", "getArrayFromDType", "offset", "forEach", "colOffset", "tIdx", "row", "resIdx", "col", "concatImplCPU", "finalOutShape", "sumInnerDims", "innerDims", "innerDim", "inOffset", "concatConfig", "Concat", "wasmConv2d", "conv2DConfig", "Conv2D", "filterId", "dilations", "$dataFormat", "convertConv2DDataFormat", "compu
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","proxyContextToMainThread","renderViaOffscreenBackBuffer","_emscripten_webgl_create_context","a0","a1","SYSCALLS","mappings","printChar","stream","curr","getStr","get64","low","high","_fd_close","fd","_fd_seek","offset_low","offset_high","whence","newOffset","_fd_write","iov","iovcnt","pnum","_pthread_cleanup_pop","execute","routine","_pthread_cleanup_push","threadParams","stackHigh","stackSize","tis","detached","global_locale","_emscripten_get_global_libc","msg","start_routine","startRoutine","time","transferList","_pthread_create","attr","_emscripten_sync_run_in_main_thread_4","_memalign","_pthread_testcancel_js","_emscripten_check_blocking_allowed","__emscripten_do_pthread_join","block","_emscripten_main_browser_thread_id","threadStatus","threadExitCode","_pthread_join","_sysconf","calledRun","r","c","A","q","l","g","o","z","m","this","run","doRun","implicit","returnCode","runCaller","ready","WasmBackendModule","UTF8Decoder","TextDecoder","endPtr","decode","BackendWasm","KernelBackend","[object Object]","super","tfjs","initWithThreadsCount","threadsCount","actualThreadsCount","getThreadsCount","DataStorage","engine","dataIdNextNumber","move","numDataIds","kernelMs","refCount","memoryOffset","numBytes","bytesPerElement","registerTensor","byteOffset","typedArrayFromBuffer","force","has","delete","dispose","unreliable","write","getPathToWasmBinary","simdSupported","threadsSupported","wasmModuleFolder","wasmPath","wasmFileMap","init","all","getAsync","factoryConfig","endsWith","blob","Blob","URL","createObjectURL","wasmPathPrefix","customFetch","instantiateWasm","imports","arrayBuffer","createInstantiateWasmFunc","initialized","onAbort","initAborted","mainScriptUrlOrBlob","wasmFactoryThreadedSimd","toString","wasmFactory","wasmBinaryNames","numThreads","usePlatformFetch","deprecationWarn","prefixOrFileMap","missingPaths","join"],"mappings":":;;;;;;;;;;oeAkBA,IAAYA,EASAC,ECJZ,IAAIC,iVDLJ,SAAYF,GACVA,yBACAA,qBACAA,mBACAA,uBACAA,6BALF,CAAYA,IAAAA,OASZ,SAAYC,GACVA,uBACAA,mBACAA,qBACAA,qBACAA,6BACAA,yBACAA,iBAPF,CAAYA,IAAAA,OC6EL,MAAME,EAAkC,CAC7CC,WAAyC,eACZC,YAAa,OACbC,UA7EF,SA AeC,GACbN,EAAkBM,EAAQC,KAAKC,MAAML,eAAc,KAAiB,CACIE,SACA,QACA,SACA,SACA,QACA,SACA,SACA,SACA,SACA,SACA,SACA,YAgEFM,WA5DF,SAA0BC,GAKxB,MAAMC,OAACA,EAAML,QAAEA,EAAOM,MAAEA,GAASF,GAC3BG,EAACA,EAACC,EAAEA,EAACC,KAAEA,EAAIC,uBAAEA,GA A0BL,EAE7C,GAAgB,YAAZE,EAAEI,OAAmC,YAAZH,EAAEG,MAC7B,MAAM,IAAIC,MACN,+DAGN,MAAMC,WAACA,EAAUC,WAAEA,EAAUC,WAAEA,EAAUC,eAAEA,GAakBV,EACvDW,EAAMjB,EAAQkB ,UAAUC,IAAIZ,EAAEa,QAAQC,GACtCC,EAAMtB,EAAQkB,UAAUC,IAAIX,EAAEY,QAAQC,GAE5C,IAAI E,EAAAS,EACb,GAAY,MAARd,EAAc,CACbB,MAAMe,EAAWxB,EAAQkB,UAAUC,IAAIV,EAAKW,QAC5C, GAA8B,IAA1BI,EAASC,MAAMC,OACjB,MAAM,IAAId,MAEN,uDAAQY,EAASC,MAAMC,WAE7BH,EAAS C,EAASH,GAEPb,MAAMM,EAAqD,MAA1BjB,EAC7B,EACAV,EAAQkB,UAAUC,IAAIT,EAAuBU,QAAQC, GACnDO,EACFnC,EAAkBsB,GACtB,GAAuB,MAAnBa,EACF,MAAM,IAAIhB,MACN,GAAGG,uEAIT,MAA Mc,EAAUhB,EAAaN,EAAEkB,MAAM,GAAKIB,EAAEkB,MAAM,GAC5CK,EAAWhB,EAAaN,EAAEiB,MAA M,GAAKjB,EAAEiB,MAAM,GAC7CM,EAAWxB,EAAEkB,MAAM,GAEnBO,EAAMhC,EAAQiC,WAAW,CA ACF,EAAUF,EAASC,GAAWvB,EAAEI,OAC1DuB,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAE1 Cc,EAAc,IAAIC,WAAW,IAAIC,WAAW9B,EAAEkB,OAAOa,QACrDC,EAAc,IAAIH,WAAW,IAAIC,WAAW7 B,EAAEiB,OAAOa,QAO3D,OALA5C,EACIuB,EAAKkB,EAAa5B,EAAEkB,MAAMC,OAAQJ,EAAKiB,EAAa/ B,EAAEiB,MAAMC,OAC5Db,EAAyC,EAAyC,EAAiBL,EAAQI,EACjDX,GAakB,EAAGkB,GAEIBF,aC9EOQ ,EACZ5C,EAAoB6C,GACtB,IAAIC,EA0BJ,MAAO,CAAC9C,WAAAA,EAAYE,YAAa,OAAQC,UAXBzC,SAA mBC,GACjB0C,EAAW1C,EAAQC,KAAKC,MAAMN,EAAY,KAAiB,CACzD,SACA,SACA,YAoBgDO,WAhBp D,SAAoBC,GAEIB,MAAMJ,QAACA,EAASK,QAAQsC,EAACA,IAAMvC,EACzBwC,EAAM5C,EAAQkB,UA AUC,IAAIwB,EAAEvB,QAAQC,GACtCW,EAAMhC,EAAQiC,WAAWU,EAAEIB,MAAOgB,GAWE,EAAEh C,OAC/CuB,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAGhD,OAAc,IAAICwB,OAAKC,cAAcd,E AAIP,QAI3BiB,EAASE,EAAKpD,EAASmD,EAAEhC,OAAQuB,GAHxBF,ICxBN,MAAMe,EAA0BP,EAAwBQ ,gBCG/CC,EACzrD,EAAoBsD,EACpBvC,GACF,IAAI+B,EA6DJ,MAAO,CAAC9C,WAAAA,EAAYE,YAAa,O AAQC,UAXDzC,SAAmBC,GACjB0C,EAAW1C,EAAQC,KAAKC,MAAMN,EAAY,KAAiB,CACzD,SACA,QA CA,SACA,SACA,QACA,SACA,SACA,YA+CgDO,WA3CpD,SAAoBC,GAEIB,MAAMJ,QAACA,EAAOK,OAA EA,GAAUD,GACpBG,EAACA,EAACC,EAAEA,GAAKH,EACTY,EAAMjB,EAAQkB,UAAUC,IAAIZ,EAAEa, QAAQC,GACtCC,EAAMtB,EAAQkB,UAAUC,IAAIX,EAAEY,QAAQC,GAEtC8B,EAAsB,MAATxC,EAAgBA,

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Found in path(s):


```

CumsumAttrs});\nTensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n  const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n    permutedOutId, CppDType[x.dtype]);\n  // transpose data back if permuted\n  let out = permutedOut;\n  if (permutation !== null) {\n    const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n      {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n    backend.disposeData(permutedX.dataId);\n  }\n  backend.disposeData(permutedOut.dataId);\n  return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as { } as KernelFunc\n};\n"}

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No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {sliceImplCPU} from './kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_, size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const
```

```

xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous)
{\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n
outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n } else {\n const outVals = backend.tensorArrayFromHeap(out);\n
outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return
out;\n }\n\n const outVals = backend.tensorArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)
{\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as
[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n
}\n }\n }\n }\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n"}

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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);"}\n
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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Add.js.map

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;IACpB,YAAY;IACZ,UAAU;IACV,YAAY;IACZ,uBAAuB;IACvB,UAAU;IACV,kBAaKB;IACIB,SAAS;IACT,S
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9B", "sourcesContent": ["/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

=====\n *\n//
We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are

```

needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport { fusedMatMulConfig }
from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from
 './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport
{anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig}
from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport
{ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport
{concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from
 './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
 './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
 './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from

```

```

./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n  zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/register_all_kernels.js.map

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No license file was found, but licenses were detected in source scan.

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"sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Floor.js.map

```

No license file was found, but licenses were detected in source scan.

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```

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S,EAAE,KAAC;IACbB,UAUU,EAAE,GAAuB;CACpC,CAAC", "sourcesContent":["/**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n

```

*\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, [number, number, number]);\n\n  function all(args: {backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {axis, keepDims} = attrs;\n    const {x
= inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const
{transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if
(inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input =
transposed;\n      inputId = transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =
util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmAll(inputId, reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n      const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n    return
out;\n  }\n\n  export const allConfig: KernelConfig = {\n    kernelName: All,\n    backendName: 'wasm',\n    setupFunc:
setup,\n    kernelFunc: all as {} as KernelFunc\n  };
}

```



```

number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,
inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction conv2d(\n  args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode, false,
$dataFormat);\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const
padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom =
convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend
Conv2D does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n    filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: conv2d as { } as KernelFunc\n};\n}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Conv2D.js.map

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```

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"../src/kernels/Reverse.ts", "../src/kernels/RotateWithOffset.ts", "../src/kernels/Round.ts", "../src/kernels/Rsqrt.ts", "../
src/kernels/ScatterNd.ts", "../src/kernels/Select.ts", "../src/kernels/Sigmoid.ts", "../src/kernels/Sin.ts", "../src/kernels/Sof
tmax.ts", "../src/kernels/SpaceToBatchND.ts", "../src/kernels/SplitV.ts", "../src/kernels/Sqrt.ts", "../src/kernels/Square.ts",
"../src/kernels/SquaredDifference.ts", "../src/kernels/Step.ts", "../src/kernels/StridedSlice.ts", "../src/kernels/Sub.ts", ".
../src/kernels/Sum.ts", "../src/kernels/Tan.ts", "../src/kernels/Tanh.ts", "../src/kernels/Tile.ts", "../src/kernels/TopK.ts", "../
src/kernels/Transform.ts", "../src/kernels/Unpack.ts", "../src/kernels/ZerosLike.ts", "../src/register_all_kernels.ts", "../sr
c/flags_wasm.ts", "../wasm-out/tfjs-backend-wasm-threaded-simd.js", "../wasm-out/tfjs-backend-wasm-threaded-
simd.worker.js", "../wasm-out/tfjs-backend-
wasm.js", "../src/backend_wasm.ts", "../src/version.ts", "../src/base.ts"], "sourcesContent": ["/**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { FusableActivation } from
'./types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,\n
biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,\n
null /* void */, [\n  'number', // a_id\n  'array', // a_shape\n  'number', // a_shape.length\n  'number', // b_id\n
'array', // b_shape\n  'number', // b_shape.length\n  'number', // transpose_a\n  'number', // transpose_b\n
'number', // activation\n  'number', // biasId\n  'number', // preluActivationWeightsId\n  'number', //
leakyreluAlpha\n  'number' // out_id\n ]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs:
_FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n  const { inputs, backend,\n
attrs } = args;\n  const { a, b, bias, preluActivationWeights } = inputs;\n\n  if (a.dtype !== 'float32' || b.dtype !==
'float32') {\n    throw new Error(\n      `_FusedMatMul for non non-float32 tensors not yet supported.`);\n  }\n}\n

```

```

const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId =
backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n ` _FusedMatMul only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n } \n biasId = biasData.id;\n }\n const preluActivationWeightsId =
preluActivationWeights == null ?\n 0 : \n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const
fusedActivation = \n FusableActivation[activation as { } as keyof typeof FusableActivation];\n if
(fusedActivation == null) {\n throw new Error(\n ` ${activation} activation not yet supported for
FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n
const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =
backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n
wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length, \n
transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId, \n
leakyreluAlpha || 0, outId);\n\n return
out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul, \n backendName:
'wasm', \n setupFunc: setup, \n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nexport function
createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:
number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // out_id\n ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}): \n
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
// Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n
wasmFunc(xId, CCppType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',
setupFunc, kernelFunc};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

```


WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport { backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nexport function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:\n  DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n    number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*\n    void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'number', // b_id\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n\n  function kernelFunc(args: { backend: BackendWasm, inputs: BinaryInputs }):\n    TensorInfo {\n    const { backend,\n    inputs } = args;\n    const { a, b } = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =\n    backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =\n    backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,\n    outputType);\n\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return\n    out;\n    }\n\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =\n    new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      CppDType[a.dtype], outId);\n\n    // Currently only some float operations support full broadcast.\n    if\n    (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n\n    const\n    aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =\n    backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n    v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&\n    loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n        `Broadcasting\n        along outer dims is not yet ` +\n        `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n\n  return\n  { kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport { Add, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n '../binary_kernel';\nconst supportsFullBroadcast = true;\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport { AddN, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:\n BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(AddN, null /* void */,\n [\n 'array', // input_ids\n
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'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n\nfunction addn(args: {inputs:
TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =
backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>
backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n
const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,
CppType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:
AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n\n"/**\n * @license\n
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'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *\n
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =
args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const
identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as
KernelFunc,\n};\n\n"/**\n * @license\n
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Apache License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an 'AS IS' BASIS,\n *\n WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *\n
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from
'./Identity';\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,
xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*
void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n
'number', // outId\n 'array', // perm\n 'number', // perm.length\n ]);\n\n\nexport function transpose(\n args:\n
{inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs,
backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better
due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n
permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n
dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const
cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out =
backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =
backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId,
xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return
out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new

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Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n  outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]\n{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if\n    (shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n      newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =\n    0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n      (minValIdx === -1 || newPerm[minValIdx] >\n      newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,\n  newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:\n  'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright\n 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an\n  "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n './backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose\n  if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank =\n  x.shape.length;\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const\n  permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let\n  inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n    axes =\n    backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n    transpose({inputs: {x}, attrs: {perm:\n    permutedAxes}, backend});\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =\n    backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n  agreed to in writing, software\n * distributed under the License is distributed on an\n  "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n */

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=====\n
*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:\n number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null\n /*void*/, [number, number, number]);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:\n AllAttrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}\n  = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n  const\n  {transposed, axes, originalAxes, inputWasTransposed} =\n  permuteAxesAndTranspose(x, axis, backend);\n  if\n  (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =\n    transposed;\n    inputId = transposedId;\n  }\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n
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backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n } \n\n if (inputWasTransposed) {\n  // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n } \n\n if (keepDims) {\n  // reshape\n  const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n } \n\n return
out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: all as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,
null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n
const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n
const { transposed, axes, originalAxes, inputWasTransposed } =\n  permuteAxesAndTranspose(x, axis,
backend);\n\n  if (inputWasTransposed) {\n  const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n  inputId = transposedId;\n } \n\n  const inputRank = input.shape.length;\n
backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n } \n\n  if (inputWasTransposed) {\n  // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n } \n\n  if (keepDims) {\n  // reshape\n  const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n } \n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { permuteAxesAndTranspose } from
'./kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n  'number', // x_id\n  'number', // dtype\n
'number', // outer_size\n  'number', // inner_size\n  'number' // out_id\n]);\n}\n\nfunction argmax(\n  args:
{ inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n  const { backend, inputs, attrs } = args;\n

```

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const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes,
inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n     // transpose
was not a no-op. We will need to dispose of this\n     // once we are done.\n     input = transposed;\n     inputId =
transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =
backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =
util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,
CppType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the
transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as {}
as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n
'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n
'number', // padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
strideHeight\n  'number', // strideWidth\n  'number', // channels\n  'number', // outId\n ]);\n}\n\nfunction
avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs,
backend} = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n
`wasm backend does not support dataFormat: ` +\n    `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n
`was backend\n  only supports average pooling with dilation = [1, 1], ` +\n    `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const
outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: avgPool as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

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\n
*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';
\n\nimport {BackendWasm} from './backend_wasm';
\n\nexport function reshape(\n  args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old `+\n    `shape must have the same number of elements.`);\n\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incref(x.dataId);\n\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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\n
*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';
\n\nimport {BackendWasm} from './backend_wasm';
\n\nimport {reshape} from './Reshape';
\n\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(`BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n    const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n\n    const batchDimA = util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n\n    const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n    util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions must either be the `+\n      `same or at least one input batch dimension must be 1. Got input `+\n      `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n    const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =\n      outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n    util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (`+\n      ` ${innerShapeB}) of Tensors with shapes ${a.shape} and `+\n      ` ${b.shape} and transposeA=${transposeA} `+\n      ` and transposeB=${transposeB} must match.`);\n\n    const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n    const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n      [batchDimB, innerShapeB, outerShapeB];\n\n    // The rest of the implementation is designed to operate on rank-3 tensors\n    const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n    const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n    const a3dId
```


YWx1ZXNbaV0gPSB2YWx1ZXNbaSAAtIDFdICsgc3RlcDtcbiAgfVxuICByZXR1cm4gdmFsdWVzO1xufVxuIl19"
,"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by
applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport { assertNotComplex } from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n  const isContinuous = slice_util.isSliceContinuous(shape, begin, size);\n  const length = util.sizeFromShape(shape);\n  const xStrides = util.computeStrides(shape);\n  if (isContinuous) {\n    const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n    if (dtype === 'string') {\n      return vals.slice(flatOffset, flatOffset + length);\n    }\n    return vals.subarray(flatOffset, flatOffset + length);\n  }\n  const decodedData = dtype === 'string' ?\n    backend_util.fromUint8ToStringArray(vals) : vals;\n  const inBuf = buffer(shape, dtype, decodedData);\n  const outBuf = buffer(size, dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const outLoc = outBuf.indexToLoc(i);\n    const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n    outBuf.set(inBuf.get(...inLoc), ...outLoc);\n  }\n  if (dtype === 'string') {\n    return backend_util.fromStringArrayToUint8(outBuf.values);\n  }\n  return outBuf.values;\n}\nexport function slice(args) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { begin, size } = attrs;\n  assertNotComplex(x, 'slice');\n  const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n  slice_util.assertParamsValid(x, $begin, $size);\n  const vals = backend.data.get(x.dataId).values;\n  const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n  return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n  kernelName: Slice,\n  backendName: 'cpu',\n  kernelFunc: slice\n};\n/#
```

sourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjojU2xpY2UuanMiLCJzb3VyY2VSb290IjojIiwicmNlcjI0Im5hbWVzIjpbXSswibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FIRzBQUVILE9BQU8sRUFBRyxZQUFZLEVbQWICLE1BQU0sRUFBC0MsS0FBSyxQUFFLFVBQVUsRUFBBUQsSUFBSyxQUFFDLE1BQU0sDUJBRXVCLENBQUM7QUFHeEwsT0FBTyxFQUFDLGDcQUFnQixQUFFDLE1BQU0sYUFBYSxDQUFDO0FBRTdDLE1BQU0sVUFBVsxTQUFTLENBQ3JCLEIBQW1CLEVBQUUsS0FBZSxFQUFFLEIBQWMsRUFBRsxLQUFILEVBQ3JFLEtBQUW7SUFDAkIsTUFBTsxXQUFXLEdBQUcsVUFBVsxDUQFDLGDcQUFnQixDUQFDLEtBQUssRUFBRsxLQUFLLEVbQUUsSUFBSyxDUQFDLENBQUM7SUFDEUStUFBTsxNQUNFLEdBQUcsSUFBSyxDUQFDLGFBBQWEsQ0FBQyxJQUFJLENBQUMsQ0FBQztJQU4QyxNQUNLFFBQVEsR0FBRYxJQUFJLENBQUMsY0FBYyxDUQFDLEtBQUssQ0FBQyxDUQFDO0IBRTVDLEIBQUksV0FBVyxQUFFO1FBQ2YsTUFBTsxVQUFVLEdBQUcsVUFBVsxDUQFDLGCQUFPQixDUQFDLEtBQUssRUFBRsxRQUFRLENBQUMsQ0FBQztRQUVqRSxJQUFJLEtBQUssS0FBSyxRQUFRLEVbQUU7WUFDdEIsT0FBUSxJQUFfQixDUQFDLEtBQUssQ0FBQyxVQUFVLEVbQUUsVUFBVsxHQUFHLE1BQU0sQ0FBQyxDUQFDLE1NBQ3RFO1FBRUQsT0FBUSxJQUFfQixDUQFDLFFBQVEsQ0FBQyxVQUFVLEVbQUUsVUFBVsxHQUFHLE1BQU0sQ0FBQyxDUQFDLE1BQU0sTUFBTsxHQUFHLE1BQU0sQ0FBQyxJQUFJLEVbQUUsRUFBRsxDUQFDLEVBQUU7UUFDEmStUFBTsxNQUNFLEdBQUcsTUFBTsxDUQFDLFBQVUsQ0FBQyxDUQFDLENBQUMsQ0FBQztRQUwQyxNQUNFLEtBQUssR0FBRYxNQUNFLENBQUMsR0FBRYxDQUFDLENBQUMsR0FBVyxQUFFLENBQUmsRUFBRsxQUFFLENBQUMsR0FBRYxHQUFHLEtBQUssQ0FBQyxDUQFDLENBQUMsQ0FBQyxDUQF

9IDA7IGkgPCBvdXRCdWYuc2l6ZTsgKypKSB7XG4gICAgY29uc3Qgb3V0TG9jID0gb3V0QnVmLmluZGV4V
G9Mb2MoaSk7XG4gICAgY29uc3QgaW5Mb2MgPSBvdXRMb2MubWFWkChpZHg6IG51bWJlciwgaikgPT4ga
WR4ICsgYmVnaW5bal0pO1xuICAgIG91dEJ1Zi5zZXQoaW5CdWYuc2V0KC4uLmluTG9jKSwgLi4ub3V0TG9j
KTtcbiAgfVxuXG4gIGlmIChkdHlwZSA9PT0gJ3N0cmluZycpIHtcbiAgICByZXR1cm4gYmFja2VuZGF91dGlsLm
Zyb21TdHJpbmdBcnJheVRvVWludDgob3V0QnVmLnZhbHVlcYBhcyBzdHJpbmdBcXSk7XG4gIH1cbiAgcmV0d
XJuIG91dEJ1Zi52YWx1ZXMGYXMGVHlwZWRCbnJheTtcbn1cblxuZXhwb3J0IGZ1bmN0aW9uIHNsaWNlKFxu
ICAgIGFyZ3M6IHtpbnB1dHM6IFNsaWNlSW5wdXRzLCBiYWNrZW5kOiBNYXRoQmFja2VuZENQVSwgYX
R0cnM6IFNsaWNlQXR0cnN9KTpcbiAgICBUZw5zb3JjbmZvIHtcbiAgY29uc3Qge2lucHV0cywgYmFja2VuZC
wgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBjb25zdCB7YmVnaW4sIHNPemV9ID
0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcbiAgICBjb25zdCB7JGJIZ2luLCAk
c2l6ZV0gPSBzbGljZV91dGlsLnBhcnNIU2xpY2VQYXJhbXMOeCwgYmVnaW4sIHNPemUpO1xuICBzbGljZV9
1dGlsLmFzc2VydFBhcmFtc1ZhbGkKHGsICRiZWdpbiwgJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYW
NrZW5kLmRhdGEuZ2V0KHguZGF0YUlkKS52YWx1ZXM7XG4gIGNvbnN0IG91dFZhbHMgPSBzbGljZUltcG
wodmFscywJGJIZ2luLCAkc2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNrZW5kLm1ha2
VUZw5zb3JjbmZvKCRzaXplLCB4LmR0eXBILCBvdXRWYWxzKTtcbn1cblxuZXhwb3J0IGNvbnN0IHNSaWN
lQ29uZmlnOiBlZlZuZuZwDb25maWcgPSB7XG4gIGtlcm51bE5hbWU6IFNsaWNlFxcuICBiYWNrZW5kTmFtZ
TogJ2NwdScsXG4gIGtlcm51bEZ1bmM6IHNSaWNlIGFzIHt9IGFzIEtlcm51bEZ1bmNcbn07XG4iXX0=","/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}  
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {sliceImplCPU} from  
 '../kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend:  
BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] =  
slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,  
size_);\n\n  const xVals = backend.readSync(x.dataId);\n\n  const out = backend.makeOutput(size_, x.dtype);\n\n  const xStrides = util.computeStrides(x.shape);\n\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous)  
{\n  const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n  if (x.dtype === 'string') {\n  outData.stringBytes =\n    (xVals as Uint8Array[]).slice(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  } else {\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(\n    (xVals as TypedArray).subarray(flatOffset, flatOffset +  
util.sizeFromShape(size_));\n  )\n  }\n\n  return out;\n  }\n\n  if (x.dtype === 'string') {\n  const res =  
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n  outData.stringBytes = res as Uint8Array[];\n  return  
out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2)  
{\n  slice2d(\n    xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n    size_ as [number, number]);\n  } else if (rank === 3) {\n  slice3d(\n    xVals as TypedArray, xStrides[0], xStrides[1],  
outVals,\n    begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4)  
{\n  slice4d(\n    xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n    begin_ as [number,  
number, number, number],\n    size_ as [number, number, number, number]);\n  } else {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n  outVals.set(res);\n  }\n\n  return  
out;\n}\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals:  
backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI;  
i++) {\n  const xOffset = i * xStride + beginJ;\n  outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
```



```
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n  TensorInfo {\n    const {inputs:
{x}, attrs: {dtype}, backend} = args;\n    const out = backend.makeOutput(x.shape, dtype);\n    const inVals =
backend.typedArrayFromHeap(x);\n    const outVals = backend.typedArrayFromHeap(out);\n    outVals.set(inVals);\n  }
return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmClip: (xId: number, min:
number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip =
backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', //
max\n    'number' // out_id\n  ]);\n}\n\nfunction clip(args: {\n  inputs: ClipByValueInputs,\n  backend:
BackendWasm,\n  attrs: ClipByValueAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmClip(xId,
clipValueMin, clipValueMax, outId);\n  return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY
KIND, either express or implied.\n * See the License for the specific language governing permissions and\n *
limitations under the License.\n *
```

```
=====\n
*\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from
 '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n    const {inputs, backend}
= args;\n\n    const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n    let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n    // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n    const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n    if ($inputs.length ===
1) {\n      return identity({inputs: {x: $inputs[0]}, backend});\n    }\n\n    const out = backend.makeOutput(outShape,
```

```

inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n  return out;\n }\n\n const shapes =
$inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype ===
'string') {\n  // Any concat of n-dimensional tensors across any axis can be reduced to\n  // a concatenation of two-
dimensional tensors across the axis 1 by first\n  // partitioning the axes of the original tensors into those less than
the\n  // axis to be concatenated and the rest. Then reshape the tensors\n  // into a two-dimensional tensor by
collapsing these two sets of axes and\n  // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n  const inputs2D = $inputs.map(t => {\n   const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n   const shape = [-1, innerSize];\n   return reshape({inputs: {x: t},
backend, attrs: {shape}});\n  });\n\n  const inputsValShapes = inputs2D.map(t => {\n   return {vals:
backend.readSync(t.dataId), shape: t.shape};\n  });\n\n  // Concat 2d tensors along axis=1.\n  outShape =\n  backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n  const simplyConcat =
inputs2D[0].shape[0] === 1;\n  const outVals = concatImplCPU(\n   inputsValShapes, outShape,
inputs[0].dtype,\n   simplyConcat) as string[];\n\n  const finalOutShape =\n  backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n  out.shape = finalOutShape;\n  const
outData = backend.dataIdMap.get(out.dataId);\n  outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n  inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n
return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims =
0;\n const innerDims = $inputs.map(input => {\n  const innerDim = util.sizeFromShape(input.shape.slice(axis));\n
sumInnerDims += innerDim;\n  return innerDim;\n });\n\n const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b <
batchDim; b++) {\n  let outOffset = b * sumInnerDims;\n  for (let i = 0; i < inVals.length; i++) {\n   const
innerDim = innerDims[i];\n   const inOffset = b * innerDim;\n   const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n   outVals.set(vals, outOffset);\n   outOffset += innerDim;\n  }\n }\n return
out;\n\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc,\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number,
filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad:
number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number,
inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n   'number', // xId\n
'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterId\n
'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n
'number', // padBottom\n   'number', // padLeft\n   'number', // isSamePad\n   'number', // dilationHeight\n
'number', // dilationWidth\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // inputChannels\n
'number', // outputChannels\n   'number', // outId\n  ]);\n\n\nfunction conv2d(\n  args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n

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(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n  pad, dimRoundingMode, false,
$dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const
padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom =
convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n  throw new Error(\n    `wasm backend
Conv2D does not support dataFormat:` +\n    ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n    filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n    outputChannels, outId);\n return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n
'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n
'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n
'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n
'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n
'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n
'number', // yChannelStride\n 'number', // outId\n ]);\n}\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n  dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n const {\n  batchSize,\n  filterHeight,\n  filterWidth,\n  inChannels,\n
inHeight,\n  inWidth,\n  outChannels,\n  outHeight,\n  outWidth,\n  strideHeight,\n  strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,

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fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n  dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n  topPad, leftPad, fltS0, fltS1, fltS2,\n xBatchStride, xRowStride,\n  xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
conv2DBackpropInput as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/*\n * @license\n
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { cast }
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest
= 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n  'number', // imagesId\n
'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n
'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n
'number', // out id\n ]);\n}\n\nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n

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attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method,
extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n const numBoxes =
boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =
[numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData =
backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =
cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData =
backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const
out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const
imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n
InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n extrapolationValue, outId);\n\n if
(castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from
'./types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n
'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' //
dtype\n ]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,
exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n
if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n\n
const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n
backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n
const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n
backend.disposeData(permutedOut.dataId);\n }\n\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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```

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```
=====
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n
'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n
'number', // outId\n  ]);\n\n  export function depthToSpace(args: {\n    backend: BackendWasm,\n    inputs:
DepthToSpaceInputs,\n    attrs: DepthToSpaceAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n    const {blockSize, dataFormat} = attrs;\n\n    const batchSize = x.shape[0];\n    const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n    const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n    const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n    const
outputHeight = inputHeight * blockSize;\n    const outputWidth = inputWidth * blockSize;\n    const outputDepth =
inputDepth / (blockSize * blockSize);\n\n    const outputShape = (dataFormat === 'NHWC') ?\n      [batchSize,
outputHeight, outputWidth, outputDepth] :\n      [batchSize, outputDepth, outputHeight, outputWidth];\n\n    const
out = backend.makeOutput(outputShape, 'float32');\n    const xData = backend.dataIdMap.get(x.dataId);\n    const
xId = xData.id;\n    const xStridesBytes =\n      new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n    const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n    const outStridesBytes =\n      new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n    wasmDepthToSpace(\n      xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n      outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n    return
out;\n  }\n\n  export const depthToSpaceConfig: KernelConfig = {\n    kernelName: DepthToSpace,\n    backendName:
'wasm',\n    setupFunc: setup,\n    kernelFunc: depthToSpace as {} as KernelFunc\n  };
\n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific
language governing permissions and\n   * limitations under the License.\n   */
\n  =====
*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight:
number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number,
outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmDepthwiseConv2d =\n    backend.wasm.cwrap(DepthwiseConv2dNative, null /*void*/, [\n      'number', //
xId\n      'number', // batchSize\n      'number', // inputHeight\n      'number', // inputWidth\n      'number', //
filterId\n      'number', // filterHeight\n      'number', // filterWidth\n      'number', // padTop\n      'number', //
padRight\n      'number', // padBottom\n      'number', // padLeft\n      'number', // isSamePad\n      'number', //
dilationHeight\n      'number', // dilationWidth\n      'number', // strideHeight\n      'number', // strideWidth\n
\n  ]);\n\n  =====
```

```

'number', // inputChannels\n      'number', // outputChannels\n      'number', // outId\n    ]);\n\nfunction
depthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs:
DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const
xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n  const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n    ($dilations as number | [number, number]), pad, dimRoundingMode,\n    true /* depthwise */);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop =
convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n\n
const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if
(convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend DepthwiseConv2dNative
does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmDepthwiseConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n    filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n  kernelName: DepthwiseConv2dNative,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
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http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
\n\n
=====\n
*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n */
\n\n
=====\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\n  createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
\n\n
=====\n
*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from

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./UnaryKernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from\n './Reshape';\n\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} =\n  attrs;\n\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if\n  (dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n        inputRank}]`);\n    $dim = inputRank + dim\n    + 1;\n  }\n  newShape.splice($dim, 0, 1);\n\n  return reshape({inputs: {x: input}, backend, attrs: {shape:\n  newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright\n 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*/\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {Fill, FillAttrs} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs:\n  FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out =\n  backend.makeOutput(shape, dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(value as\n  number);\n  return out;\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName:\n  'wasm',\n  kernelFunc: fill as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*/\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-\n  core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch:\n  number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,\n  null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', //\n  imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId =\n  backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch,\n  imageHeight, imageWidth, numChannels] = image.shape;\n\n  wasmFlipLeftRight(\n    imageId, batch,
```

```

imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as { } as
KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n  FusedBatchNorm, null /* void */,\n  ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n  xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```
=====
*\n\nimport { backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ FusibleActivation } from './types';\n\nlet wasmFusedConv2d:\n  (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number,
padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number,
dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n  'number', // xId\n  'number', //
batchSize\n  'number', // inputHeight\n  'number', // inputWidth\n  'number', // filterId\n  'number', //
filterHeight\n  'number', // filterWidth\n  'number', // biasId\n  'number', // padTop\n  'number', // padRight\n
'number', // padBottom\n  'number', // padLeft\n  'number', // isSamePad\n  'number', // dilationHeight\n
'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number', //
inputChannels\n  'number', // outputChannels\n  'number', // activation\n  'number', //
preluActivationWeightsId\n  'number', // leakyreluAlpha\n  'number', // outId\n  ]);\n\nfunction
fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n})
{\n  const { inputs, attrs, backend } = args;\n  const { x, filter, bias, preluActivationWeights } = inputs;\n  const {\n
strides,\n  pad,\n  dilations,\n  dataFormat,\n  dimRoundingMode,\n  activation,\n  leakyreluAlpha\n  } =
attrs;\n\n  const convInfo = backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode);\n\n  const fusedActivation =\n  FusibleActivation[activation as {}] as keyof typeof FusibleActivation;\n\n  if (fusedActivation == null) {\n  throw
new Error(\n    ` ${activation} activation not yet supported for FusedConv2D ` +\n    ` in the wasm backend.`);\n
}\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n  const outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if
(bias != null) {\n  const biasData = backend.dataIdMap.get(bias.dataId);\n  if (biasData.shape.length !== 1) {\n
throw new Error(\n    `FusedConv2D only supports rank-1 bias but got ` +\n    `rank
${biasData.shape.length}.`);\n  }\n  if (biasData.shape[0] !== outputChannels) {\n  throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n    `match the number of output channels
(${outputChannels})`);\n  }\n  biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const
filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n\n  if
(dataFormat !== 'NHWC') {\n  throw new Error(\n    `wasm backend FusedConv2D does not support
dataFormat:` +\n    ` ${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n  0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n  wasmFusedConv2d(\n    xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n    fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n  return out;\n}\n\nexport const fusedConv2DConfig:
```

KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

=====
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\n  function
fusedDepthwiseConv2d(args: {\n    inputs: FusedDepthwiseConv2DInputs,\n    backend: BackendWasm,\n    attrs:
FusedDepthwiseConv2DAttrs\n}) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter, bias,
preluActivationWeights} = inputs;\n    const {\n      strides,\n      pad,\n      dilations,\n      dataFormat,\n
      dimRoundingMode,\n      activation,\n      leakyreluAlpha\n    } = attrs;\n\n    const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
      pad, dimRoundingMode, true /* depthwise */);\n\n    const fusedActivation =\n      FusableActivation[activation as {}
as keyof typeof FusableActivation];\n    if (fusedActivation == null) {\n      throw new Error(\n        `${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n        `in the wasm backend.`);\n    }\n\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const
outputChannels = convInfo.outChannels;\n\n    let biasId = 0;\n    if (bias != null) {\n      const biasData =
backend.dataIdMap.get(bias.dataId);\n      if (biasData.shape.length !== 1) {\n        throw new Error(\n
          `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n            `rank ${biasData.shape.length}.`);\n      }\n
      if (biasData.shape[0] !== outputChannels) {\n        throw new Error(\n
          `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n            `match the number of output channels (${outputChannels})`);\n      }\n
      biasId = biasData.id;\n    }\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const
padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels =
convInfo.inChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    const batchSize =
convInfo.batchSize;\n    const inHeight = convInfo.inHeight;\n    const inWidth = convInfo.inWidth;\n\n    if
(dataFormat !== 'NHWC') {\n      throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n        `${dataFormat}`. Please use 'NHWC'.`);\n    }\n\n    const out =

```



```

backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n  xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n  biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n  dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n", "/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *\n
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n
'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n
'number', // sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}): \n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} =
inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params,
indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return
out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes,
outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n", "/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
*\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *\n
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n    'number', // xId\n    'number', // dtype\n
'array', // xStrides\n    'number', // stridesSize\n    'number', // indicesId\n    'number', // batchSize\n
'array', // outStrides\n    'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,

```

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indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index
= indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n ]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n"/**\n
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====
*\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from
'./types';\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n  'number', // x_id\n  'number', // dtype\n  'number', // leakyrelu_alpha\n  'number', //
out_id\n  ]);\n}\nexport function leakyRelu(\n  args: \n    {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm});\n  TensorInfo {\n    const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    // According to TF API, LeakyRelu returns float32 when input is either
float32\n    // or int32.\n    const out = backend.makeOutput(x.shape, 'float32');\n\n    if (util.sizeFromShape(x.shape)
!== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n    }\n\n    return out;\n  }\n}\nexport const leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n  backendName: 'wasm',\n  setupFunc,\n  kernelFunc: leakyRelu as {} as KernelFunc,\n};\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\ncreateBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
 may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
 {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
 number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
 BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n
 'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n}\n\nfunction max(args: {backend:
 BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n  const {backend, inputs, attrs} = args;\n
 const {reductionIndices: axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId =
 backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes,
 inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n
 const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId =
 transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('max',
 axes, inputRank);\n  const [outShape, reduceShape] =\n
 backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
 util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
 (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
 wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the
 transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
 const
 newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
 return out;\n}\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n
 setupFunc: setup,\n  kernelFunc: max as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n", "/**\n * @license\n * Copyright 2019 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n  'number', //
inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n  'number', //
padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
dilationHeight\n  'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number',
// inputChannels\n  'number', // outputChannels\n  'number', // outId\n ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnnpack which only\n  // supports float32.\n  //\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  //\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype
=== 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm
backend does not support dataFormat:` +\n      ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const
out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

```

=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n  args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n  TensorInfo {\n  const {backend, inputs,
attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes,

```

```

inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId
!== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input =
transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n    }\n}\n\n backend_util.assertAxesAreInnerMostDims(\n    'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n    castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n    // dispose of the transposed
tensor.\n    backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n    backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n    kernelName: Mean,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: mean as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n    void;\n\nfunction setup(backend:
BackendWasm): void {\n    wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n        'number', // x_id\n
'number', // dtype\n        'number', // reduce_size\n        'number', // out_id\n    ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n    inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n        const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n        if (transposedId !== xId) {\n            // transpose was not a no-op. We
will need to dispose of this\n            // once we are done.\n            input = transposed;\n            inputId =
transposedId;\n        }\n    }\n\n    const inputRank = input.shape.length;\n\n    backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n    const [outShape, reduceShape] =\n        backend_util.computeOutAndReduceShapes(input.shape,
axes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape,
input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n        const outId =
backend.dataIdMap.get(out.dataId).id;\n        wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n    }\n\n    if
(inputWasTransposed) {\n        // dispose of the transposed tensor.\n        backend.disposeData(transposed.dataId);\n
}\n\n    if (keepDims) {\n        // reshape\n        const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n        out.shape = newShape;\n    }\n\n    return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: min as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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```

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```
=====  
* \nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n  createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2021 Google  
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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 WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n *
```

```
=====  
* \nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-  
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n// Must match  
enum in MirrorPad.cc\nenum MirrorPaddingMode { \n  reflect = 0,\n  symmetric = 1\n}\nlet wasmMirrorPad: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes:  
  Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\nfunction  
  setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-  
  paddings\n    'array', // post-paddings\n    'number', // mode\n    'number', // outId\n  ]);\n  function  
  mirrorPad(args: {\n    inputs: MirrorPadInputs,\n    backend: BackendWasm,\n    attrs: MirrorPadAttrs\n  }) {\n    const  
  {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n    const outShape = paddings.map(\n      (p, i) => p[0] /*  
  beforePad */ + x.shape[i] + p[1] /* afterPad */);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =  
  backend.makeOutput(outShape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const  
  xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    const prePaddingsFlat =  
  paddings.map(padTuple => padTuple[0]);\n    const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n    const prePaddingsBytes =\n      new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n    const  
  postPaddingsBytes =\n      new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n    wasmMirrorPad(\n      xId, xShapeBytes, x.shape.length, CCppType[x.dtype], prePaddingsBytes,\n      postPaddingsBytes,  
  MirrorPaddingMode[mode], outId);\n    return out;\n  }\n  export const mirrorPadConfig: KernelConfig = {\n    kernelName: MirrorPad,\n    backendName: 'wasm',\n    kernelFunc: mirrorPad as { } as KernelFunc,\n    setupFunc:  
  setup\n  };\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the  
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 License.\n * You may obtain a copy of the License at\n *  
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
 License.\n *
```

```
=====  
* \nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2020 Google  
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```

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```
=====\n*\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in\n`non_max_suppression_impl.h`\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the\n * shape equivalent to\n * `Result`\n */\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:\n  number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const\n  pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const\n  pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,\n  pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,\n  NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)\n=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n  NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n  ]);\n}\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs:\n  NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold,\n  maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =\n  backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n  const\n  resOffset =\n  wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n  const\n  {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n  parseResultStruct(backend, resOffset);\n  // Since we are not using scores for V3, we have to delete it from the heap.\n  backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n  const selectedIndicesTensor\n  =\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n  return\n  selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:\n  NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {\n  }\n  as\n  KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
```


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```
=====  
*/  
import { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,  
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';  
import { BackendWasm } from './backend_wasm';  
import { parseResultStruct } from './NonMaxSuppression_util';  
let wasmFunc: (n  
boxesId: number, scoresId: number, maxOutputSize: number, iouThreshold: number, scoreThreshold: number,  
padToMaxOutputSize: boolean) => number;  
function setup(backend: BackendWasm): void {  
  wasmFunc =  
    backend.wasm.cwrap(  
      NonMaxSuppressionV4, 'number', // Result*  
      [ 'number', // boxesId  
        'number', // scoresId  
        'number', // maxOutputSize  
        'number', // iouThreshold  
        'number', // scoreThreshold  
        'bool', // padToMaxOutputSize  
      ],  
    );  
  function nonMaxSuppressionV4(args: {  
    backend: BackendWasm,  
    inputs: NonMaxSuppressionV4Inputs,  
    attrs: NonMaxSuppressionV4Attrs  
  }):  
    TensorInfo[] {  
    const { backend, inputs, attrs } = args;  
    const { iouThreshold, maxOutputSize, scoreThreshold,  
      padToMaxOutputSize } = attrs;  
    const { boxes, scores } = inputs;  
    const boxesId =  
      backend.dataIdMap.get(boxes.dataId).id;  
    const scoresId = backend.dataIdMap.get(scores.dataId).id;  
    const resOffset = wasmFunc(  
      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,  
      padToMaxOutputSize);  
    const { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =  
      parseResultStruct(backend, resOffset);  
    // Since we are not using scores for V4, we have to delete it from the  
    heap.  
    backend.wasm._free(pSelectedScores);  
    const selectedIndicesTensor =  
      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);  
    const validOutputsTensor =  
      backend.makeOutput([], 'int32', pValidOutputs);  
    return [selectedIndicesTensor,  
      validOutputsTensor];  
  }  
  export const nonMaxSuppressionV4Config: KernelConfig = {  
    kernelName:  
      NonMaxSuppressionV4,  
    backendName: 'wasm',  
    setupFunc: setup,  
    kernelFunc: nonMaxSuppressionV4 as { }  
    as KernelFunc,  
  };  
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   * License.  
   */  
}
```

```
=====  
*/  
import { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,  
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';  
import { BackendWasm } from './backend_wasm';  
import { parseResultStruct } from './NonMaxSuppression_util';  
let wasmFunc: (n  
boxesId: number, scoresId: number, maxOutputSize: number, iouThreshold: number, scoreThreshold: number,  
softNmsSigma: number) => number;  
function setup(backend: BackendWasm): void {  
  wasmFunc =  
    backend.wasm.cwrap(  
      NonMaxSuppressionV5, 'number', // Result*  
      [ 'number', // boxesId  
        'number', // scoresId  
        'number', // maxOutputSize  
        'number', // iouThreshold  
        'number', // scoreThreshold  
        'number', // softNmsSigma  
      ],  
    );  
  function kernelFunc(args: {  
    backend:  
      BackendWasm,  
    inputs: NonMaxSuppressionV5Inputs,  
    attrs: NonMaxSuppressionV5Attrs  
  }): TensorInfo[]  
  {  
    const { backend, inputs, attrs } = args;  
    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma }  
      = attrs;  
    const { boxes, scores } = inputs;  
    const boxesId = backend.dataIdMap.get(boxes.dataId).id;  
    const scoresId = backend.dataIdMap.get(scores.dataId).id;  
    const resOffset = wasmFunc(  
      boxesId, scoresId,  
      maxOutputSize, iouThreshold, scoreThreshold,  
      softNmsSigma);  
    const { pSelectedIndices, selectedSize,  
      softNmsSigma } =  
      parseResultStruct(backend, resOffset);  
    const selectedIndicesTensor =  
      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);  
    const validOutputsTensor =  
      backend.makeOutput([], 'int32', pValidOutputs);  
    return [selectedIndicesTensor,  
      validOutputsTensor];  
  }  
  export const nonMaxSuppressionV5Config: KernelConfig = {  
    kernelName:  
      NonMaxSuppressionV5,  
    backendName: 'wasm',  
    setupFunc: setup,  
    kernelFunc: kernelFunc as { }  
    as KernelFunc,  
  };  
  /**  
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   * implied.  
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   * limitations under the  
   * License.  
   */  
}
```

```

pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n    backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return
[selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth:
number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n
'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n ]);\n}\n\nfunction
oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs,
backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n
wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig:
KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as
{ } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const
onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as

```

{ } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { concat } from './Concat';\nimport { expandDims } from './ExpandDims';\n\nexport function pack(\n  args: { inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs }):\n  TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { axis } = attrs;\n\n  if (inputs.length === 1) {\n    return expandDims(\n      { inputs: { input: inputs[0] }, backend, attrs: { dim: axis }});\n  }\n\n  const shape = inputs[0].shape;\n  const dtype = inputs[0].dtype;\n\n  inputs.forEach(t => {\n    util.assertShapesMatch(\n      shape, t.shape, \n      'All tensors passed to stack must have matching shapes');\n    util.assert(\n      dtype === t.dtype, \n      () => 'All tensors passed to stack must have matching dtypes');\n  });\n\n  const intermediateTensorInfos: TensorInfo[] = [];\n  const expandedTensors = inputs.map(t => {\n    const expandedT =\n      expandDims({ input: t }, backend, attrs: { dim: axis });\n    intermediateTensorInfos.push(expandedT);\n    return expandedT;\n  });\n\n  const result = concat({ inputs: expandedTensors, backend, attrs: { axis }});\n\n  intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n  return result;\n}\n\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { fill } from './Fill';\nimport { CppDType } from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, \n  constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);\n\n  function pad(\n    args: { inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs }) {\n    const { inputs: { x }, backend, attrs: { paddings, constantValue }} = args;\n\n    const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n    if (util.sizeFromShape(x.shape) === 0) {\n      // Short-circuit the computation, since x doesn't have value, only\n      // the shape is used to compute output shape to pad.\n      return fill({\n        backend,\n        attrs: { shape: outShape, value: constantValue, dtype: x.dtype }\n      });\n    }\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(outShape, x.dtype);\n    const outTensorData = backend.dataIdMap.get(out.dataId);\n    const outId = outTensorData.id;\n\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n    const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n    const prePaddingsBytes =\n      new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n    const postPaddingsBytes =\n      new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n    wasmPadV2(\n      xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n      postPaddingsBytes, constantValue, outId);\n    return out;\n  }\n\n  export
```

```
const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as {} as\n  KernelFunc,\n  setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n  compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { KernelConfig, Pow } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All\n  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\nlet wasmPrelu: (xId: number,\n weightsId: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =\n  backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' //\n    out_id\n  ]);\n  function prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n    const { inputs, backend }\n    = args;\n    const { x, alpha } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId =\n    backend.dataIdMap.get(alpha.dataId).id;\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if\n    (input.dtype !== 'float32') {\n      castedInput = cast({ backend, inputs: { x },\n        attrs: { dtype: 'float32' });\n      inputId =\n      backend.dataIdMap.get(castedInput.dataId).id;\n    }\n    const out = backend.makeOutput(x.shape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n    if (input.dtype\n    !== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n    return out;\n  }\n  export const preluConfig:\n  KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {} as\n    KernelFunc\n  }; \n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n  License.\n *
```

```
=====\n*\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmProd: (\n  xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\nfunction setup(backend:\n BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs:\n    ProdAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x }\n    = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n    const\n    { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n  }\n}
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let reductionAxes = axes;\n if (inputWasTransposed) {\n  const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n  if (transposedId !== xId) {\n    // transpose was not a no-op. We
will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId = transposedId;\n
reductionAxes = backend_util.getInnerMostAxes(\n    reductionAxes.length, input.shape.length);\n  }\n }\n\n
backend_util.assertAxesAreInnerMostDims(\n  'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n  // dispose of
the transposed tensor.\n  backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n  // reshape\n  const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\nimport
{ BackendWasm } from '../backend_wasm';\nimport { rangeImplCPU } from '../kernel_utils/shared';\n\nexport const
range =\n  (args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n    const { backend, attrs } =
args;\n    const { start, stop, step, dtype } = attrs;\n    const values = rangeImplCPU(start, stop, step,
dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backendtypedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use
this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n *
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```
=====\n*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', // oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', // newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n}\nfunction resizeBilinear(args: {\n  backend: BackendWasm,\n  inputs: ResizeBilinearInputs,\n  attrs: ResizeBilinearAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {images} = inputs;\n  const {alignCorners, halfPixelCenters, size} = attrs;\n  const [newHeight, newWidth] = size;\n  const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n  const outShape = [batch, newHeight, newWidth, numChannels];\n  let xData = backend.dataIdMap.get(images.dataId);\n  let castedData;\n  if (xData.dtype !== 'float32') {\n    castedData =\n      cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n    xData =\n      backend.dataIdMap.get(castedData.dataId);\n  }\n  const xId = xData.id;\n  const out =\n    backend.makeOutput(outShape, 'float32');\n  if (util.sizeFromShape(images.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmResizeBilinear(\n    xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n    alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n  if (castedData !== null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\nexport const resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: resizeBilinear as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n
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'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number'
// out_id\n ]);\n}\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} =
attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return
identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n}\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n  fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n  'number', // xId\n  'number', //
batch\n  'number', // imageHeight\n  'number', // imageWidth\n  'number', // numChannels\n  'number', //
radians\n  'number', // centerX\n  'number', // centerY\n  'array', // fillBytes\n  'number', // fillLength\n
'number', // outId\n ]);\n}\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =
backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n\n  const fillValues =
typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n    [...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n  imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n  centerY,
fillBytes, fillValues.length, outId);\n  return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from

```

```
./UnaryKernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *  
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
./UnaryKernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *  
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version  
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}  
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from  
./types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank:  
number, numUpdates: number, sliceSize: number, strides: Uint8Array, outputSize: number, outId: number)  
=> void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,  
null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', //  
sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs:  
ScatterNdInputs, attrs: ScatterNdAttrs\n    }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices,  
updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if  
(util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides,  
outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData =  
backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData =  
backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n\n    const stridesBytes = new  
Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates, sliceSize,  
stridesBytes, outputSize, outId);\n\n    return out;\n  }\n\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as  
KernelFunc\n  };\n", "/*\n *  
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n *
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\nimport  
{BackendWasm} from '../backend_wasm';\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number,  
offset: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmSelect =  
backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n    'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: {inputs: SelectInputs, backend:
```



```

BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 :\n
util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as { }
as KernelFunc,\n setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs});\n
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out
= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n"/**\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"/**\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n
'number', // channels\n 'number' // batch\n ]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs});\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} =
args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,
logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n

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```

const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if
(util.sizeFromShape(out.shape) === 0) {\n  return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return
out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { padV2Config } from
'./PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\n\nfunction
spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:
SpaceToBatchNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockShape,
paddings } = attrs;\n  const prod = util.sizeFromShape(blockShape);\n  const completePaddings: Array<[number,
number]> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<[number, number]>));\n  for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n  const paddedX =
padV2Config.kernelFunc({\n    inputs: { x },\n    backend,\n    attrs: { paddings: completePaddings, constantValue:
0 }\n  }) as TensorInfo;\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
reshapedPaddedShape.length, blockShape.length, false);\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n  const reshapeInputs:
ReshapeInputs = { x: paddedX };\n  const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n  const
paddedXReshaped =\n    reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n  const transposeInputs:
TransposeInputs = { x: paddedXReshaped };\n  const transposeAttrs:\n    TransposeAttrs = { perm:
permutedReshapedPaddedPermutation };\n  const paddedXT =\n    transpose({ inputs: transposeInputs, backend,
attrs: transposeAttrs });\n  const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n  const
resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n  const result = reshape(\n    { inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n  backend.disposeData(paddedX.dataId);\n
backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n  return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n", "/*\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport { KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util } from '@tensorflow/tfjs-
core';\n\nimport { backend_util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'../backend_wasm';\n\nimport { slice } from './Slice';\n\nexport function splitV(\n  args: { inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm }) {\n  const { inputs, attrs, backend } = args;\n  const { x } = inputs;\n  const
{ numOrSizeSplits, axis } = attrs;\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n  const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n

```


Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as { } as KernelFunc\n};\n", "/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,  
util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { reshape } from  
 './Reshape';\nimport { slice } from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,  
  xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:  
  Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction  
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n    'number', // xId\n    'array', // xStrides\n    'number', // xRank\n    'array', // beginBytes\n    'array', // endBytes\n    'array', // stridesBytes\n    'array', // outShapeBytes\n    'array', // outStridesBytes\n    'number', //  
    outShapeLength\n    'number', // outId\n  ]);\n\n  export function stridedSlice(args: {\n    backend: BackendWasm,\n    inputs: StridedSliceInputs,\n    attrs: StridedSliceAttrs\n}): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { x } = inputs;\n\n    const {\n      begin,\n      end,\n      strides,\n      beginMask,\n      endMask,\n      ellipsisMask,\n      newAxisMask,\n      shrinkAxisMask\n    } = attrs;\n\n    const {\n      finalShapeSparse,\n      finalShape,\n      isIdentity,\n      sliceDim0,\n      isSimpleSlice,\n      begin: $begin,\n      end: $end,\n      strides: $strides\n    } =\n      slice_util.sliceInfo(\n        x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n        newAxisMask, shrinkAxisMask);\n\n    let result;\n\n    if (isIdentity) {\n      // Optimization #1, slice is a no-op plus reshape\n      result = reshape({ inputs: { x },  
      backend, attrs: { shape: finalShape } });\n    } else if (sliceDim0 || isSimpleSlice) {\n      // Optimization #2, slice is  
      memory contiguous (only occurs in dim 0)\n      util.assert(\n        x.shape.length >= 1,\n        () => `Input must have  
      rank at least 1, got: ${x.shape.length}`);\n      const size = slice_util.computeOutShape($begin, $end, $strides);\n      // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n      const sliced = slice({ inputs: { x },  
      backend, attrs: { begin: $begin, size } });\n      result =\n        reshape({ inputs: { x: sliced }, backend, attrs: { shape:  
      finalShape } });\n      backend.disposeData(sliced.dataId);\n    } else {\n      const out =  
      backend.makeOutput(finalShapeSparse, 'float32');\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const  
      xStridesBytes =\n        new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n      const beginBytes  
      = new Uint8Array(new Int32Array($begin).buffer);\n      const endBytes = new Uint8Array(new  
      Int32Array($end).buffer);\n      const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n      const  
      outputShapeBytes =\n        new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n      const outStridesBytes =  
      new Uint8Array(\n        new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n      const outId =  
      backend.dataIdMap.get(out.dataId).id;\n      wasmStridedSlice(\n        xId, xStridesBytes, x.shape.length,  
      beginBytes, endBytes, stridesBytes,\n        outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n      result = reshape({ inputs: { x: out }, backend, attrs: { shape: finalShape } });\n      backend.disposeData(out.dataId);\n    }\n\n    return result;\n  }\n\n  export const stridedSliceConfig: KernelConfig = {\n    kernelName: StridedSlice,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: stridedSlice as { } as KernelFunc\n};\n", "/**\n *  
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable  
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Sub } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
```

```

'/binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmSum: (xId:\n number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n    'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n}\n\nfunction sum(args: { backend:\n BackendWasm, inputs: SumInputs, attrs: SumAttrs }):\n TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let\n  inputId = xId;\n  let input = x;\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n  permuteAxesAndTranspose(x, axis, backend);\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const\n    transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was\n      not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =\n      transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length,\n        input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,\n    input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =\n  util.sizeFromShape(reduceShape);\n  const out = backend.makeOutput(outShape, input.dtype);\n  if\n  (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n  if (inputWasTransposed) {\n    // dispose of\n    the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n    // reshape\n    const\n    newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n  return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport { KernelConfig, Tan } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n

```

```
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTile: (\n  xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', // x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n\n  function tile(\n    args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const {reps} = attrs;\n    const newShape: number[] = new Array(x.shape.length);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = x.shape[i] * reps[i];\n    }\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n    const out = backend.makeOutput(newShape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmTile(xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n      CppDType[out.dtype], outId);\n    return out;\n  }\n\n  export const tileConfig: KernelConfig = {\n    kernelName: Tile,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: tile as {} as KernelFunc\n  }; \n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted: boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x_shape\n    'number', // x_shape.length\n    'number', // x.dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n    'number', // outIndicesId\n  ]);\n\n  export const topk: (\n    args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) => \n    TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n    const {x} = inputs;\n    const {k, sorted} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    const outputShape = x.shape.slice();\n    outputShape[outputShape.length - 1] = k;\n    const outValues = backend.makeOutput(outputShape, x.dtype);\n    const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n    const outIndices = backend.makeOutput(outputShape, 'int32');\n    const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n    wasmTopK(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n      outValuesId, outIndicesId);\n    return [outValues, outIndices];\n  };\n\n  export const topKConfig: KernelConfig = {\n    kernelName: TopK,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: topk as {} as KernelFunc\n  }; \n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
```

Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmTransform: (\n  imageId:\n  number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth:\n  number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number)\n=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,\n  null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n}\n\nfunction transform(\n  args: {\n    backend: BackendWasm, inputs: TransformInputs, attrs:\n    TransformAttrs\n  }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { image, transforms } = inputs;\n  const { interpolation, fillMode, fillValue, outputShape } = attrs;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  const [outHeight, outWidth] =\n    outputShape != null ? outputShape :\n    [imageHeight, imageWidth];\n  const outShape =\n    [batch, outHeight, outWidth,\n    numChannels] as\n    [number, number, number, number];\n  const strides =\n    new Uint8Array(new\n    Int32Array(util.computeStrides(image.shape)).buffer);\n  const out = backend.makeOutput(outShape,\n  image.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const imageData =\n  backend.dataIdMap.get(image.dataId);\n  const imageId = imageData.id;\n  const transformsData =\n  backend.dataIdMap.get(transforms.dataId);\n  const transformsId = transformsData.id;\n  const\n  interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let fillModeId;\n  switch (fillMode) {\n    case 'constant':\n      fillModeId = 1;\n      break;\n    case 'reflect':\n      fillModeId = 2;\n      break;\n    case 'wrap':\n      fillModeId = 3;\n      break;\n    case 'nearest':\n      fillModeId = 4;\n      break;\n    default:\n      fillModeId = 1;\n      break;\n  }\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n    outWidth, numChannels, imageWidth, imageHeight, strides,\n    image.shape.length - 1, interpolationModeId,\n    fillModeId, fillValue,\n    outId);\n  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as {} as\n  KernelFunc\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { slice } from\n './Slice';\n\nfunction unpack(\n  args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs\n  }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <\n  0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =\n  value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;
```

```

i++) {\n  if (i !== axis) {\n    outShape[outIndex++] = value.shape[i];\n  }\n}\nconst outs: TensorInfo[] = new
Array(numOutputs);\nconst begin = new Array(rank).fill(0);\nconst size = value.shape.slice();\nsize[axis] = 1;\nfor (let i = 0; i < outs.length; i++) {\n  begin[axis] = i;\n  outs[i] = slice({inputs: {x: value}, attrs: {begin, size},
backend});\n}\nreturn outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const
unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as {} as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

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=====\n
*/\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:
BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const
zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

```

=====\n */\n\nWe explicitly import the modular kernels so they get registered in the\n// global registry when we compile the
library. A modular build would replace\n// the contents of this file and import only the kernels that are
needed.\n\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig}
from './kernels/_FusedMatMul';\n\nimport {absConfig} from './kernels/Abs';\n\nimport {addConfig} from
 './kernels/Add';\n\nimport {addNConfig} from './kernels/AddN';\n\nimport {allConfig} from './kernels/All';\n\nimport
{anyConfig} from './kernels/Any';\n\nimport {argMaxConfig} from './kernels/ArgMax';\n\nimport {avgPoolConfig}
from './kernels/AvgPool';\n\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\n\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\n\nimport {castConfig} from './kernels/Cast';\n\nimport
{ceilConfig} from './kernels/Ceil';\n\nimport {clipByValueConfig} from './kernels/ClipByValue';\n\nimport
{concatConfig} from './kernels/Concat';\n\nimport {conv2DConfig} from './kernels/Conv2D';\n\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\n\nimport {cosConfig} from
 './kernels/Cos';\n\nimport {coshConfig} from './kernels/Cosh';\n\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\n\nimport {cumsumConfig} from './kernels/Cumsum';\n\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\n\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\n\nimport {eluConfig} from './kernels/Elu';\n\nimport {equalConfig} from
 './kernels/Equal';\n\nimport {expConfig} from './kernels/Exp';\n\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\n\nimport {fillConfig} from './kernels/Fill';\n\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\n\nimport {floorConfig} from './kernels/Floor';\n\nimport {floorDivConfig} from
 './kernels/FloorDiv';\n\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\n\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\n\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\n\nimport {gatherNdConfig} from './kernels/GatherNd';\n\nimport
{gatherV2Config} from './kernels/GatherV2';\n\nimport {greaterConfig} from './kernels/Greater';\n\nimport

```



```

{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  \n absConfig,\n  \n addConfig,\n  \n addNConfig,\n  \n allConfig,\n  \n anyConfig,\n
  \n argMaxConfig,\n  \n avgPoolConfig,\n  \n batchMatMulConfig,\n  \n batchToSpaceNDConfig,\n  \n castConfig,\n
  \n ceilConfig,\n  \n clipByValueConfig,\n  \n concatConfig,\n  \n conv2DConfig,\n  \n conv2DBackpropInputConfig,\n
  \n cosConfig,\n  \n coshConfig,\n  \n cropAndResizeConfig,\n  \n cumsumConfig,\n  \n depthToSpaceConfig,\n
  \n depthwiseConv2dNativeConfig,\n  \n eluConfig,\n  \n equalConfig,\n  \n expConfig,\n  \n expandDimsConfig,\n
  \n fillConfig,\n  \n flipLeftRightConfig,\n  \n floorConfig,\n  \n floorDivConfig,\n  \n fusedMatMulConfig,\n
  \n fusedBatchNormConfig,\n  \n fusedConv2DConfig,\n  \n fusedDepthwiseConv2DConfig,\n  \n gatherNdConfig,\n
  \n gatherV2Config,\n  \n greaterConfig,\n  \n greaterEqualConfig,\n  \n identityConfig,\n  \n leakyReluConfig,\n
  \n lessConfig,\n  \n lessEqualConfig,\n  \n logConfig,\n  \n logicalAndConfig,\n  \n maxConfig,\n  \n maximumConfig,\n
  \n maxPoolConfig,\n  \n meanConfig,\n  \n minConfig,\n  \n minimumConfig,\n  \n mirrorPadConfig,\n  \n multiplyConfig,\n
  \n negConfig,\n  \n nonMaxSuppressionV3Config,\n  \n nonMaxSuppressionV4Config,\n  \n nonMaxSuppressionV5Config,\n
  \n notEqualConfig,\n  \n oneHotConfig,\n  \n onesLikeConfig,\n  \n packConfig,\n  \n padV2Config,\n  \n powConfig,\n
  \n preluConfig,\n  \n prodConfig,\n  \n rangeConfig,\n  \n realDivConfig,\n  \n reluConfig,\n  \n relu6Config,\n
  \n reshapeConfig,\n  \n resizeBilinearConfig,\n  \n reverseConfig,\n  \n rotateWithOffsetConfig,\n  \n rsqrtConfig,\n
  \n roundConfig,\n  \n scatterNdConfig,\n  \n selectConfig,\n  \n sigmoidConfig,\n  \n sinConfig,\n  \n sliceConfig,\n
  \n softmaxConfig,\n  \n spaceToBatchNDConfig,\n  \n splitVConfig,\n  \n sqrtConfig,\n  \n squareConfig,\n
  \n squaredDifferenceConfig,\n  \n stepConfig,\n  \n stridedSliceConfig,\n  \n subConfig,\n  \n sumConfig,\n
  \n tanConfig,\n  \n tanhConfig,\n  \n tileConfig,\n  \n topKConfig,\n  \n transformConfig,\n  \n transposeConfig,\n
  \n unpackConfig,\n  \n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  \n registerKernel(kernelConfig);\n}\n\n", "/**\n *

```



```

ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"^\"}else{scriptDirectory=__dirname+\"^\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\/g,\"^\"})arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error(\"The
\\\"worker_threads\\\" module is not supported in this node.js build - perhaps a newer version is needed?\");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=\"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=\"=0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\"^\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr

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ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={ };if(!warnOnce.shown[text]){ warnOnce.shown[text]=1;er
r(text) } }var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object"){ abort(\"no native wasm
support detected\") }var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){ if(!condition){ abort(\"Assertion failed: \"+text) } }function getCFunc(ident){ var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func }function ccall(ident,returnType,argTypes,args,opts){ var toC={\"string\":function(str){ var
ret=0;if(str!==null&&str!==undefined&&str!==0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len) }return ret},\"array\":function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret } };function
convertReturnValue(ret){ if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret } var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){ for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){ if(stack===0)stack=stackSave();cArgs[i]=converter(args[i]) } else { cArgs[i
]=args[i] } } } var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret }function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){ return type===\"number\" });var
numericRet=returnType!=\"string\";if(numericRet&&numericArgs&&!opts){ return getCFunc(ident) }return
function(){ return ccall(ident,returnType,argTypes,arguments,opts) } }function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){ var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){ str+=String.fromCharCode(u0);continue } var
u1=heap[idx++]&63;if((u0&224)===192){ str+=String.fromCharCode((u0&31)<<6|u1);continue } var
u2=heap[idx++]&63;if((u0&240)===224){ u0=(u0&15)<<12|u1<<6|u2 } else { u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63 } if(u0<65536){ str+=String.fromCharCode(u0) } else { var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) } }return str }function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\" }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){ if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){ var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10|u1&1023) } if(u<=127){ if(outIdx>=endIdx)break;heap[outIdx++]
=u } else if(u<=2047){ if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63 } else
if(u<=65535){ if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63 } else { if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63 } } heap[outIdx]=0;return outIdx-startIdx }function
stringToUTF8(str,outPtr,maxBytesToWrite){ return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite) }function lengthBytesUTF8(str){ var
len=0;for(var i=0;i<str.length;++i){ var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10|str.charCodeAtAt(++i)&1023);if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4 }return len }function
writeArrayToMemory(array,buffer){ GROWABLE_HEAP_I8().set(array,buffer) }function
alignUp(x,multiple){ if(x%multiple>0){ x+=multiple-x%multiple }return x } var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function

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updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDeps
endencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return

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hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)}})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)}})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["I"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency("wasm-
instantiate")}))}}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("wasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(Promise.reject);return{}}var
ASM_CONSTS={10520:function(){throw"Canceled!"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0})}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EB
ADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQU:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,

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EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emsripten_futex_wake\"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emsripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors();runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emsripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\": \"exit\"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pth
read_self(),-1);postMessage({\"cmd\": \"cancelDone\"}),terminateAllThreads:function(){for(var t in
PThread.threads){var

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pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThread.
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.threads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=un
defined}}),runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[_emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[_emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!="_pthread_self"){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{con
sole.error('Internal error! Worker sent a message \''+cmd+' to target pthread '+d["targetThread"]+'', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\spawnThread\"){spawnThread(e.data)}else
if(cmd===\cleanupThread\"){cleanupThread(d["thread"])}else
if(cmd===\killThread\"){killThread(d["thread"])}else
if(cmd===\cancelThread\"){cancelThread(d["thread"])}else
if(cmd===\loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\print\"){out("Thread \"+d["threadId"]+"\":
'+d["text"])}else if(cmd===\printErr\"){err("Thread \"+d["threadId"]+"\": \"+d["text"])}else
if(cmd===\alert\"){alert("Thread \"+d["threadId"]+"\": \"+d["text"])}else if(cmd===\exit\"){var
detached=worker pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}else
if(cmd===\exitProcess\"){try{exit(d["returnCode"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\setimmediate\"){worker.postMessage(e.data)}else{err(\worker sent an unknown command
'+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\pthread sent
an error! \"+e.filename+"\":\"+e.lineno+"\":
'+e.message)};if(ENVIRONMENT_IS_NODE){worker.on("message",function(data){worker.onmessage({data:d
ata})});worker.on("error",function(data){worker.onerror(data)});worker.on("exit",function(data){})}worker.post
Message({"cmd":\load\,"urlOrBlob":Module["mainScriptUrlOrBlob"]||_scriptDir,\wasmMemory":wasmMe
memory,\wasmModule":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\tfjs-
backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var

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t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module["establishStackSpace"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module["getNoExitRuntime"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module["invokeEntryPoint"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort("\"Assertion failed: \"'+UTF8ToString(condition)+'\", at:
\"'+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process["hrtime"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module["__performance_now_clock_drift"]}}else if(typeof
dateNow!=="undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({"cmd":"processQueuedMainThreadWork"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({"targetThread":targetThreadId,"cmd":"processThreadQueu
e"})}else{var pthread=PThread.threads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({"cmd":"processThreadQueue"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret==="timed-out")return-
73;if(ret==="not-equal")return-6;if(ret==="ok")return 0;throw" Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),_emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var

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double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index,numCallArgs,args){_emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emsripten_realloc_buffer(size){try{wasmmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmMemory.buffer);return
1}catch(e){}}function _emsripten_resize_heap(requestedSize){var
oldSize=_emsripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--

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)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=\"undefined\"?document:0,typeof window!=\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function

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_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ ex
t["vertexAttribDivisorANGLE"](index,divisor);}; ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ ext["drawArraysInstancedANGLE"](mode,first,count,primcount);}; ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount);};
return 1 } }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){ return
ext["createVertexArrayOES"]();}; ctx["deleteVertexArray"]=function(vao){ ext["deleteVertexArrayOES"](vao);};
ctx["bindVertexArray"]=function(vao){ ext["bindVertexArrayOES"](vao);}; ctx["isVertexArray"]=function(vao)
{ return ext["isVertexArrayOES"](vao);}; return 1 } }function __webgl_enable_WEBGL_draw_buffers(ctx){ var
ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ ctx["drawBuffers"]=function(n,bufs){ ext["drawBuffers
WEBGL"](n,bufs);}; return 1 } }function
__webgl_enable_WEBGL_multi_draw(ctx){ return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_dra
w"))}var
GL={ counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{ },offscreenCanvases:{ },timerQueriesEXT:[],programInfos:{ },stringCache:{ },unpackAlignment:4,recordError:
function recordError(errorCode){ if(!GL.lastError){ GL.lastError=errorCode } },getNewId:function(table){ var
ret=GL.counter++;for(var i=table.length;i<ret;i++){ table[i]=null }return
ret },getSource:function(shader,count,string,length){ var source="";for(var i=0;i<count;++i){ var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source },createContext:function(canvas,webGLContextAttributes){ var
ctx=canvas.getContext("webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle },registerContext:function(ctx,webGLContextAttributes){ var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={ handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx };if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){ GL.initExtensions(context)}return
handle },makeContextCurrent:function(contextHandle){ GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){ return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){ if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===object")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null },initExtensions:f
unction(context){ if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){ if(ext.indexOf("lose_context")<0&&ext.inde
xOf("debug")<0){ GLctx.getExtension(ext) } } ),populateUniformTable:function(program){ var
p=GL.programs[program];var
ptable=GL.programInfos[program]={ uniforms:{ },maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1 };var utable=ptable.uniforms;var

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numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\\"+j+"\\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","\low-power","\high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(4
0>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){stream===1?out:err}(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
__fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function __fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
__fd_write(fd,iow,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iow,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iow+i*8>>2];var len=GROWABLE_HEAP_I32()[iow+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function __pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
__pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz

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e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),
tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd\":"run\","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
__pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===undefined){err("Current
environment does not support SharedArrayBuffer, pthreads are not available!");return
6}if(!pthread_ptr){err("pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
__emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw"Canceled!"}function
__emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread");}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err("pthread_join attempted on a null thread
pointer!");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err("PThread
"+thread+" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&__emscripten_main_browser_thread_id()===thread){err("Main thread
"+thread+" is attempting to join to itself!");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err("pthread_join attempted on thread
"+thread+", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
"+thread+", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){__emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT

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HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var __wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};

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ts));var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][_"L"]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][_"M"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][_"N"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][_"O"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][_"P"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][_"Q"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][_"R"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][_"S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][_"T"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][_"U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][_"V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][_"W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][_"X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][_"Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][_" _"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module

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ule["asm"]["ga"].apply(null,arguments));var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["ha"].apply(null,arguments));var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"].apply(null,arguments));var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"].apply(null,arguments));var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"].apply(null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["la"].apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["ma"].apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["na"].apply(null,arguments));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["oa"].apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["pa"].apply(null,arguments));var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]["qa"].apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["ra"].apply(null,arguments));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["sa"].apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["ta"].apply(null,arguments));var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["ua"].apply(null,arguments));var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["va"].apply(null,arguments));var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["wa"].apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["xa"].apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["ya"].apply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["za"].apply(null,arguments));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]["Aa"].apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"]["Ba"].apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"]["Ca"].apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["Da"].apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["Ea"].apply

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y(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"La"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"Ma"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"Na"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"Oa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"Pa"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"Qa"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Ra"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Sa"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ta"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Ua"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Va"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Wa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Xa"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][_"Ya"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Za"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][_"a"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Sa"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"ab"]).apply(null,arguments)};

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nts));var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_pthread_self=Module["_pthread_self"]=function(){return(_pthread_self=Module["_pthread_self"]=Module["asm"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"][["pb"]]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"][["qb"]]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][["rb"]]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"][["sb"]]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm"][["tb"]]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=Module["asm"][["ub"]]).apply(null,arguments)};var

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WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r
return instance.exports};function
moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module["wasmModule"]=e.data.wa
smModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;
Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof
e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd===\"objectTransfer\"){Module["PThread"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module["__performance_now_clock_drift"]=performance.now()-
e.data.time;Module["__emscripten_thread_init\""](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace\""](top,max);Module["__emscripten_tls_init\""](
);Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self
\"](),1);try{var
result=Module["invokeEntryPoint\""](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime\""]())Module["
PThread"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module["PThread"].threadCancel()}else
if(ex!==\"unwind\")if(ex instanceof
Module["ExitStatus\"]){if(Module["getNoExitRuntime\""]()){else{Module["PThread"].threadExit(ex.status)}}el
se{Module["PThread"].threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel\")if(Module["_pthread_self\""]()){Module["PThread"].threadCancel()}else
if(e.data.target===\"setimmediate\")else
if(e.data.cmd===\"processThreadQueue\")if(Module["_pthread_self\""]){Module["__emscripten_current_thread_
process_queued_calls\""]()}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"\\nvar
WasmBackendModule = (function() {\\n var _scriptId = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\\n if (typeof __filename !== 'undefined')
_scriptId = _scriptId || __filename;\\n return (\\nfunction(WasmBackendModule) {\\n WasmBackendModule =
WasmBackendModule || {};\\n\\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule: {};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"] =new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\\.this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof

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process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\g,\"/\"))arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\")read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\")return new
Uint8Array(readbuffer(f))data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\")arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\")arguments_=arguments}if(typeof
quit===\"function\")quit_=function(status){quit(status)}if(typeof print!=\"undefined\")if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} else {var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object"){abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function

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convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}var UTF8Decoder=typeof
TextDecoder!=\"undefined\"?new TextDecoder(\"utf8\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new
Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new
Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new
Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new
Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module[\"preRun\"]){if(typeof
Module[\"preRun\"]!==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){a
ddOnPreRun(Module[\"preRun\"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof
Module[\"postRun\"]!==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].lengt

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h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
dependencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort("+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"]);function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)

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    } } else { func(callback.arg === undefined ? null : callback.arg) } } function _abort() { abort() } function
    _emscripten_memcpy_big(dest, src, num) { HEAPU8.copyWithin(dest, src, src + num) } function
    _emscripten_get_heap_size() { return HEAPU8.length } function
    emscripten_realloc_buffer(size) { try { wasmMemory.grow(size -
    buffer.byteLength + 65535 >>> 16); updateGlobalBufferAndViews(wasmMemory.buffer); return
    1 } catch (e) { } } function _emscripten_resize_heap(requestedSize) { var oldSize = _emscripten_get_heap_size(); var
    maxHeapSize = 2147483648; if (requestedSize > maxHeapSize) { return false } for (var
    cutDown = 1; cutDown <= 4; cutDown *= 2) { var
    overGrownHeapSize = oldSize * (1 + 2 / cutDown); overGrownHeapSize = Math.min(overGrownHeapSize, requestedSize
    + 100663296); var
    newSize = Math.min(maxHeapSize, alignUp(Math.max(requestedSize, overGrownHeapSize), 65536)); var
    replacement = emscripten_realloc_buffer(newSize); if (replacement) { return true } return false } var
    SYSCALLS = { mappings: {}, buffers: [null, [], []], printChar: function(stream, curr) { var
    buffer = SYSCALLS.buffers[stream]; if (curr === 0 || curr === 10) { (stream === 1 ? out:err)(UTF8ArrayToString(buffer, 0));
    buffer.length = 0 } else { buffer.push(curr) }, varargs: undefined, get: function() { SYSCALLS.varargs += 4; var
    ret = HEAP32[SYSCALLS.varargs - 4 >> 2]; return ret }, getStr: function(ptr) { var ret = UTF8ToString(ptr); return
    ret }, get64: function(low, high) { return low } }; function _fd_close(fd) { return 0 } function
    _fd_seek(fd, offset_low, offset_high, whence, newOffset) { } function _fd_write(fd, iov, iovcnt, pnum) { var num = 0; for (var
    i = 0; i < iovcnt; i++) { var ptr = HEAP32[iov + i * 8 >> 2]; var len = HEAP32[iov + (i * 8 + 4) >> 2]; for (var
    j = 0; j < len; j++) { SYSCALLS.printChar(fd, HEAPU8[ptr + j]) } num += len } HEAP32[pnum >> 2] = num; return 0 } function
    _pthread_create() { return 6 } function _pthread_join() { return 28 } function
    setErrNo(value) { HEAP32[___errno_location() >> 2] = value; return value } function
    _sysconf(name) { switch (name) { case 30: return 16384; case 85: var maxHeapSize = 2147483648; return
    maxHeapSize / 16384; case 132: case 133: case 12: case 137: case 138: case 15: case 235: case 16: case 17: case 18: case
    19: case 20: case 149: case 13: case 10: case 236: case 153: case 9: case 21: case 22: case 159: case 154: case 14: case
    77: case 78: case 139: case 82: case 68: case 67: case 164: case 11: case 29: case 47: case 48: case 95: case 52: case 51: case
    46: return 200809; case 27: case 246: case 127: case 128: case 23: case 24: case 160: case 161: case 181: case 182: case
    242: case 183: case 184: case 243: case 244: case 245: case 165: case 178: case 179: case 49: case 50: case 168: case
    169: case 175: case 170: case 171: case 172: case 97: case 76: case 32: case 173: case 35: case 80: case 81: case 79: return -
    1; case 176: case 177: case 7: case 155: case 8: case 157: case 125: case 126: case 92: case 93: case 129: case 130: case
    131: case 94: case 91: return 1; case 74: case 60: case 69: case 70: case 4: return 1024; case 31: case 42: case 72: return
    32; case 87: case 26: case 33: return 2147483647; case 34: case 1: return 47839; case 38: case 36: return 99; case 43: case
    37: return 2048; case 0: return 2097152; case 3: return 65536; case 28: return 32768; case 44: return 32767; case 75: return
    16384; case 39: return 1e3; case 89: return 700; case 71: return 256; case 40: return 255; case 2: return 100; case 180: return
    64; case 25: return 20; case 5: return 16; case 6: return 6; case 73: return 4; case 84: { if (typeof
    navigator === "object") return navigator["hardwareConcurrency"] || 1; return 1 } setErrNo(28); return -1 } var
    asmLibraryArg = { "a": _abort, "d": _emscripten_memcpy_big, "e": _emscripten_resize_heap, "f": _fd_close, "c": _f
    d_seek, "b": _fd_write, "h": _pthread_create, "g": _pthread_join, "i": _sysconf }; var asm = createWasm(); var
    ___wasm_call_ctors = Module["___wasm_call_ctors"] = function() { return (___wasm_call_ctors = Module["___wasm
    _call_ctors"] = Module["asm"])[["k"]].apply(null, arguments) }; var
    _init = Module["_init"] = function() { return (_init = Module["_init"] = Module["asm"])[["l"]].apply(null, arguments) };
    var
    _init_with_threads_count = Module["_init_with_threads_count"] = function() { return (_init_with_threads_count = Mod
    ule["_init_with_threads_count"] = Module["asm"])[["m"]].apply(null, arguments) }; var
    _get_threads_count = Module["_get_threads_count"] = function() { return (_get_threads_count = Module["_get_threads
    _count"] = Module["asm"])[["n"]].apply(null, arguments) }; var
    _register_tensor = Module["_register_tensor"] = function() { return (_register_tensor = Module["_register_tensor"] = M
    odule["asm"])[["o"]].apply(null, arguments) }; var

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_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"][["p"]]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"][["q"]]).apply(null,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"][["s"]]).apply(null,arguments)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"][["t"]]).apply(null,arguments)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][["u"]]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][["v"]]).apply(null,arguments)};var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][["w"]]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][["x"]]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][["y"]]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][["z"]]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][["A"]]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][["B"]]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][["C"]]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][["D"]]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][["E"]]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][["F"]]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][["G"]]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][["H"]]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][["I"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][["J"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][["K"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][["L"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][["M"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][["N"]]).apply(null,arguments)};var

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_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][_"R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][_"S"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][_"T"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][_"U"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][_"V"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][_"W"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_"X"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"Y"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"Z"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_" _"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"$"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"aa"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"ba"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ha"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][_"ja"]).apply(null,arguments)};var

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_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ha"]]).apply(null,arguments)};var

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_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["Va"]]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ya"]]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Module["setStatus"]("\n"),1});doRun(),1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}}run();\n\n return WasmBackendModule.ready\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you

```

may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,  
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,  
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\n\nimport {BackendWasmThreadedSimdModule} from  
../wasm-out/tfjs-backend-wasm-threaded-simd';\n\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-  
backend-wasm-threaded-simd.js';\n\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-  
wasm-threaded-simd.worker.js';\n\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\n\ninterface  
TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount:  
number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\n\nexport  
type DataId = object; // object instead of {} to force non-primitive.\n\n\nexport class BackendWasm extends  
KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap:  
DataStorage<TensorData>;\n\n  constructor(public wasm:  
BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n\n    this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape:  
number[], dtype: DataType):\n  DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n\n    this.move(dataId, values, shape, dtype, 1);\n\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return  
this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start =  
util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n    dataId:  
DataId, values: backend_util.BackendValues, shape: number[],\n    dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n        dataId,\n        {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n    }\n    return;\n  }\n\n  const size = util.sizeFromShape(shape);\n  const numBytes = size *  
util.bytesPerElement(dtype);\n  const memoryOffset = this.wasm._malloc(numBytes);\n\n  this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n  this.wasm.tfjs.registerTensor(id, size,  
memoryOffset);\n\n  if (values != null) {\n    this.wasm.HEAPU8.set(\n      new Uint8Array(\n        (values  
as backend_util.TypedArray).buffer,\n        (values as backend_util.TypedArray).byteOffset, numBytes),\n      memoryOffset);\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return  
this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset,  
dtype, shape, stringBytes} =\n      this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n      memoryOffset,\n      memoryOffset +  
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false  
otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =  
this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n    }\n\n    this.dataIdMap.delete(dataId);\n    return true;\n  }\n\n  /** Return refCount of a `TensorData` */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =  
this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision():  
32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n}

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dispose() {\n  this.wasm.tfjs.dispose();\n  if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n  }\n  this.wasm = null;\n  }\n\n memory() {\n  return {unreliable:
false};\n  }\n\n /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated
elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n   makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n   TensorInfo {\n     let dataId: {};\n     if (memoryOffset
== null) {\n       dataId = this.write(null /* values */, shape, dtype);\n     } else {\n       const id =
this.dataIdNextNumber++;\n       dataId = {id};\n       this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n       const size = util.sizeFromShape(shape);\n       this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n     }\n     return {dataId, shape, dtype};\n   }\n\n   typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n   backend_util.TypedArray {\n     const buffer = this.wasm.HEAPU8.buffer;\n     const
{memoryOffset} = this.dataIdMap.get(dataId);\n     const size = util.sizeFromShape(shape);\n     switch (dtype) {\n
case 'float32':\n       return new Float32Array(buffer, memoryOffset, size);\n     case 'int32':\n       return new
Int32Array(buffer, memoryOffset, size);\n     case 'bool':\n       return new Uint8Array(buffer, memoryOffset,
size);\n     default:\n       throw new Error(`Unknown dtype ${dtype}`);\n     }\n   }\n\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// miniprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n    if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n    }\n    response.arrayBuffer().then(binary => {\n
      WebAssembly.instantiate(binary, imports).then(output => {\n        callback(output.instance, output.module);\n
      });\n    });\n    return {};\n  });\n\n\n  /**\n   * Returns the path of the WASM binary.\n   * @param
simdSupported whether SIMD is supported\n   * @param threadsSupported whether multithreading is supported\n   *
@param wasmModuleFolder the directory containing the WASM binaries.\n   */\n  function getPathToWasmBinary(\n    simdSupported: boolean, threadsSupported: boolean,\n    wasmModuleFolder: string) {\n    if (wasmPath != null) {\n
// If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return
wasmPath;\n    }\n\n    let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n    if (simdSupported &&
threadsSupported) {\n      path = 'tfjs-backend-wasm-threaded-simd.wasm';\n    } else if (simdSupported) {\n      path =
'tfjs-backend-wasm-simd.wasm';\n    }\n\n    if (wasmFileMap != null) {\n      if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n      }\n    }\n\n    return wasmModuleFolder + path;\n  }\n\n\n  /**\n   * Initializes the wasm
module and creates the js <--> wasm bridge.\n   * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n   * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n   * in
Chrome 76).\n   */\n  export async function init(): Promise<{wasm: BackendWasmModule}> {\n    const
[simdSupported, threadsSupported] = await Promise.all([\n      env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n      env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n    ]);\n\n    return new Promise((resolve, reject) =>
{\n      const factoryConfig: WasmFactoryConfig = {};\n\n      /**\n       * This function overrides the Emscripten
module locateFile utility.\n       * @param path The relative path to the file that needs to be loaded.\n       * @param
prefix The path to the main JavaScript file's directory.\n       */\n      factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const blob = new
Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n      if
(path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n          simdSupported as boolean,\n          threadsSupported as boolean,\n          wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n    });\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n      factoryConfig.instantiateWasm =\n      createInstantiateWasmFunc(getPathToWasmBinary(\n        simdSupported as boolean, threadsSupported as
boolean,\n        wasmPathPrefix != null ? wasmPathPrefix : ''));\n    }\n\n    let initialized = false;\n    factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten already called console.warn so no need to

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double log;\n    return;\n    }\n    if (initAborted) {\n        // Emscripten calls `onAbort` twice, resulting in double
error\n        // messages.\n        return;\n    }\n    initAborted = true;\n    const rejectMsg =\n        'Make sure the
server can serve the `.wasm` file relative to the ' +\n        'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers;\n
reject({message: rejectMsg});\n    };\n\n    let wasm: Promise<BackendWasmModule>;\n    // If `wasmPath` has
been defined we must initialize the vanilla module.\n    if (threadsSupported && simdSupported && wasmPath ==
null) {\n        factoryConfig.mainScriptUrlOrBlob = new Blob(\n            [\n                var WasmBackendModuleThreadedSimd = `
+\n                wasmFactoryThreadedSimd.toString()),\n                {type: 'text/javascript'});\n        wasm =
wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n        // The wasmFactory works for both vanilla and SIMD
binaries.\n        wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM module has been successfully
created by the factory.\n    // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n    init:
module.cwrap('init', null, []),\n    initWithThreadsCount:\n        module.cwrap('init_with_threads_count', null,
['number']),\n    getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n    registerTensor:
module.cwrap(\n        'register_tensor', null,\n        [\n            'number', // id\n            'number', // size\n
'number', // memoryOffset\n        ]),\n    disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n    dispose: module.cwrap('dispose', voidReturnType, []),\n    };;\n\n    resolve({wasm: module});\n
});;\n});\n\nfunction typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n    switch (dtype) {\n        case 'float32':\n            return new Float32Array(buffer);\n        case
'int32':\n            return new Int32Array(buffer);\n        case 'bool':\n            return new Uint8Array(buffer);\n        default:\n
throw new Error(`Unknown dtype ${dtype}`);\n    }\n}\n\nconst wasmBinaryNames = [\n    'tfjs-backend-wasm.wasm',
'tfjs-backend-wasm-simd.wasm',\n    'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ninterface
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*\n * ^\n * export function setWasmPath(path: string, usePlatformFetch = false): void {\n    deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n        ' will be removed in a future release.);\n    if
(initAborted) {\n        throw new Error(\n            'The WASM backend was already initialized. Make sure you call ' +\n
            `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n    }\n    wasmPath = path;\n    customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * \n * \n * setWasmPaths({\n *
'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * \n * tf.setBackend('wasm');\n *
*\n * \n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled,
threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the
locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * \n * @doc {heading:
'Environment', namespace: 'wasm'}\n * ^\n * export function setWasmPaths(\n    prefixOrFileMap: string|{\n        [key in
WasmBinaryName]?: string},\n    usePlatformFetch = false): void {\n    if (initAborted) {\n        throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n        `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n        `tf.ready()`);\n    }\n\n    if (typeof prefixOrFileMap === 'string') {\n        wasmPathPrefix
= prefixOrFileMap;\n    } else {\n        wasmFileMap = prefixOrFileMap;\n        const missingPaths =\n

```


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No license file was found, but licenses were detected in source scan.

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All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n  float32 = 0,\n  int32 = 1,\n  bool = 2,\n  string = 3,\n  complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n  linear = 0,\n  relu = 1,\n  relu6 = 2,\n  prelu = 3,\n  leakyrelu = 4,\n  sigmoid = 5,\n  elu = 6\n}\n\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { FusableActivation } from './types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number, biasId: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number', // activation\n    'number', // biasId\n    'number', // preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number' // out_id\n  ]);\n\nfunction fusedBatchMatMul(args: {\n  inputs: _FusedMatMulInputs,\n  backend: BackendWasm,\n  attrs: _FusedMatMulAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { a, b, bias, preluActivationWeights } = inputs;\n\n  if (a.dtype !== 'float32' || b.dtype !==

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'float32') {\n  throw new Error(\n    `FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\nconst {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId =\n backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if\n (bias != null) {\n  const biasData = backend.dataIdMap.get(bias.dataId);\n  if (biasData.shape.length != 1) {\n  throw new Error(\n    `FusedMatMul only supports rank-1 bias but got ` +\n    `rank\n    ${biasData.shape.length}`);\n  }\n  biasId = biasData.id;\n }\n const preluActivationWeightsId =\n preluActivationWeights == null ?\n  0 : \n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const\n fusedActivation =\n  FusableActivation[activation as { } as keyof typeof FusableActivation];\n if\n (fusedActivation == null) {\n  throw new Error(\n    `${activation} activation not yet supported for\n    FusedConv2D ` +\n    `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =\n backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new\n Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n  aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n  transposeA,\n  transposeB, fusedActivation, biasId, preluActivationWeightsId,\n  leakyreluAlpha || 0, outId);\n\n return\n out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n  kernelName: _FusedMatMul,\n  backendName:\n  'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchMatMul as { } as KernelFunc;\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n  License at\n  *\n * http://www.apache.org/licenses/LICENSE-2.0\n  *\n * Unless required by applicable law or\n  agreed to in writing, software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for\n  the specific language governing permissions and\n  * limitations under the License.\n  *\n  *=====\n\n  *\n  *\\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n  *\\nimport\n  * {BackendWasm} from './backend_wasm';\n  *\\nimport {CppType} from './types';\n  *\\nexport function\n  * createUnaryKernelConfig(\n  *   kernelName: string, outType?: DataType): KernelConfig {\n  *   let wasmFunc: (xId:\n  *   number, dtype: number, outId: number) => void;\n  *   function setupFunc(backend: BackendWasm): void {\n  *   wasmFunc = backend.wasm.cwrap(kernelName, null /* void */,\n  *   [\n  *   'number', // x_id\n  *   'number', // dtype\n  *   'number', // out_id\n  *   ]);\n  *   }\n  *   function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n  *   TensorInfo {\n  *   const {backend, inputs: {x}} = args;\n  *   const xId = backend.dataIdMap.get(x.dataId).id;\n  *   const\n  *   out = backend.makeOutput(x.shape, outType || x.dtype);\n  *   const outId = backend.dataIdMap.get(out.dataId).id;\n  *   \n  *   // Short-circuit zero-sized tensors.\n  *   if (util.sizeFromShape(out.shape) === 0) {\n  *   return out;\n  *   }\n  *   \n  *   wasmFunc(xId, CCppType[x.dtype], outId);\n  *   return out;\n  *   }\n  *   return {kernelName, backendName: 'wasm',\n  *   setupFunc, kernelFunc};\n  * }\n  * }\n  *"/**\n  * @license\n  * Copyright 2019 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the \"License\");\n  * you may not use this file except in\n  * compliance with the License.\n  * You may obtain a copy of the License at\n  *\n  * http://www.apache.org/licenses/LICENSE-2.0\n  *\n  * Unless required by applicable law or agreed to in writing,\n  * software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  * WITHOUT WARRANTIES\n  * OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for the specific language\n  * governing permissions and\n  * limitations under the License.\n  *\n  *=====\n\n  *\n  *\\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n  *\\nimport {createUnaryKernelConfig} from\n  * './unary_kernel';\n  *\\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n  * }\n  *"/**\n  * @license\n  * Copyright 2019 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the\n  * \"License\");\n  * you may not use this file except in compliance with the License.\n  * You may obtain a copy of the\n  * License at\n  * *\n  * http://www.apache.org/licenses/LICENSE-2.0\n  * *\n  * Unless required by applicable law or
```

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```
=====\n*\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\nexport function createBinaryKernelConfig(kernelName: string, supportsFullBroadcast: boolean, dtype?: DataType): KernelConfig {\n  let wasmFunc: (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number, bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) => void;\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n  function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}): TensorInfo {\n    const {backend, inputs} = args;\n    const {a, b} = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId = backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape, outputType);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return out;\n    }\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const kernelFunc = () => wasmFunc(aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length, CppDType[a.dtype], outId);\n    // Currently only some float operations support full broadcast.\n    if (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n    const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA && loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(`Broadcasting along outer dims is not yet ` +\n        `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n  return {\n    kernelName, backendName: 'wasm', setupFunc, kernelFunc;\n  };\n}\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\nlet wasmFunc: (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) => void;\nfunction setupFunc(backend:
```

```

BackendWasm): void {
  wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [
    'array', // input_ids
    'number', // input_ids.length
    'number', // dtype
    'number', // out_id
  ]);
}

function addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {
  const {inputs, backend} = args;
  const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);

  // Short-circuit zero-sized tensors.
  if (util.sizeFromShape(out.shape) === 0) {
    return out;
  }

  const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);
  const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);
  const outId = backend.dataIdMap.get(out.dataId).id;
  wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);

  return out;
}

export const addNConfig: KernelConfig = {
  kernelName: AddN,
  backendName: 'wasm',
  setupFunc,
  kernelFunc: addn as { } as KernelFunc,
};

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 */
=====
import {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';
import {TensorInfo} from '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
export function identity(args: {inputs: IdentityInputs, backend: BackendWasm}): TensorInfo {
  const {inputs, backend} = args;
  const out = backend.makeOutput(x.shape, x.dtype);
  const inVals = backend.typedArrayFromHeap(x);
  const outVals = backend.typedArrayFromHeap(out);
  outVals.set(inVals);
  return out;
}

export const identityConfig: KernelConfig = {
  kernelName: Identity,
  backendName: 'wasm',
  kernelFunc: identity as { } as KernelFunc,
};

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 */
=====
import {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import {identity} from './Identity';
import {CppType} from './types';
let wasmTranspose: (xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType, outId: number, perm: Uint8Array, permLength: number) => void;

function setup(backend: BackendWasm) {
  wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [
    'number', // xId
    'array', // x.shape
    'number', // x.shape.length
    'number', // dtype
    'number', // outId
    'array', // perm
    'number', // perm.length
  ]);
}

export function transpose(args: {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}): TensorInfo {
  const {inputs, backend, attrs} = args;
  // Reduce any dimensions with size one. Lower-rank transpose kernel performs
  // better due to simpler memory access pattern.
  const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);

  let permIsNoOp = true;
  for (let i = 0; i < perm.length; i++) {
    if (perm[i] !== i) {
      permIsNoOp = false;
    }
  }

  const outShape = computeOutShape(inputs.x.shape, attrs.perm);
  const x = {
    dataId: inputs.x.dataId,
    shape: reducedShape,
    dtype: inputs.x.dtype,
  };

  if (permIsNoOp) {
    const cloned = identity({inputs, backend});
    cloned.shape = outShape;
    return cloned;
  }

  const out = backend.makeOutput(outShape, x.dtype);
  const xId = backend.dataIdMap.get(x.dataId).id;
  const outId = backend.dataIdMap.get(out.dataId).id;
  const permBytes = new Uint8Array(new Int32Array(perm).buffer);
  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);

  wasmTranspose(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes, perm.length);
  return

```

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out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new
Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n  return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]
{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if
(shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n
newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j =
0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >
newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape,
newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName:
'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright
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=====
*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from
'./backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
@param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[], backend: BackendWasm): {\n    transposed: TensorInfo|null,\n    axes: number[],\n    originalAxes: number[],\n    inputWasTransposed: boolean\n  } {\n    const xShape = x.shape;\n    const xRank =
x.shape.length;\n\n    const originalAxes = util.parseAxisParam(axis, xShape);\n    let axes = originalAxes;\n    const
permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n    let xTransposed = null;\n    let
inputWasTransposed = false;\n    if (permutedAxes !== null) {\n      const newShape: number[] = new Array(xRank);\n      for (let i = 0; i < newShape.length; i++) {\n        newShape[i] = xShape[permutedAxes[i]];\n      }\n      axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n      xTransposed =\n        transpose({inputs: {x}, attrs: {perm:
permutedAxes}, backend});\n\n      const xId = backend.dataIdMap.get(x.dataId).id;\n      const transposedId =
backend.dataIdMap.get(xTransposed.dataId).id;\n      if (transposedId !== xId) {\n        inputWasTransposed = true;\n      }\n    }\n\n    return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n  }\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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```

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=====
*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, ['number, number, number']);\n}\n\nfunction all(args: { backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs }):\n  TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x
= inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const
{transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if
(inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      input =
transposed;\n      inputId = transposedId;\n    }\n\n    const inputRank = input.shape.length;\n

```



```

backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n
out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:\n
setup,\n kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n
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=====\n
*/\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from\n
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport\n
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:\n
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,\n
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,\n
attrs: AnyAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n
const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n
const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis,\n
backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n
input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n
backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n
out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:\n
setup,\n kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n
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=====\n
*/\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-\n
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { permuteAxesAndTranspose } from\n
'./kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:\n
number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n\n
wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n
'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n ]);\n}\n\nfunction argmax(\n args:

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```

{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n  const {backend, inputs, attrs} = args;\n  const {axis} = attrs as {} as ArgMaxAttrs;\n  const {x} = inputs as {} as ArgMaxInputs;\n  const xId =\n  backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes,\n  inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose\n      was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =\n      transposedId;\n    }\n  }\n\n  const outShape = input.shape.slice(0, -1);\n  const out =\n  backend.makeOutput(outShape, 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const outerSize =\n  util.sizeFromShape(out.shape);\n  const innerSize = input.shape[axes[0]];\n  wasmFunc(inputId,\n  CppDType[input.dtype], outerSize, innerSize, outId);\n\n  if (inputWasTransposed) {\n    // dispose of the\n    transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  return out;\n}\n\nexport const\n  argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n  kernelFunc: argmax as {} as KernelFunc,\n  setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n  Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  "License");\n * you may not use this file\n  except in compliance with the License.\n * You may obtain a copy of the License at\n  *\n  * http://www.apache.org/licenses/LICENSE-2.0\n  *\n  * Unless required by applicable law or agreed to in writing,\n  software\n  * distributed under the License is distributed on an\n  "AS IS"\n  * BASIS,\n  * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for the specific language\n  governing permissions and\n  * limitations under the License.\n  *\n  =====\n  *\n  import {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from\n  '@tensorflow/tfjs-core';\n  import {BackendWasm} from '../backend_wasm';\n  let wasmAvgPool: (\n  xId:\n  number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:\n  number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n  strideWidth: number, channels: number, outId: number) => void;\n\n  function setup(backend: BackendWasm) {\n    wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //\n    strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n    ]);\n  }\n\n  function\n  avgPool(\n  args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n    const {inputs, attrs,\n    backend} = args;\n\n    const x = inputs.x as Tensor4D;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n\n    const\n    {filterSize, strides, pad, dimRoundingMode} = attrs;\n    const convInfo = backend_util.computePool2DInfo(\n    x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n    const filterHeight =\n    convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const\n    padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft =\n    convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const channels = convInfo.inChannels;\n\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n      `wasm backend does not support dataFormat: ` +\n      ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n    }\n\n    if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n      throw new Error(\n      `was backend\n      only supports average pooling with dilation = [1, 1], ` +\n      ` got [${convInfo.dilationHeight},\n      ${convInfo.dilationWidth}].`);\n    }\n\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const\n    outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],\n    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n    return out;\n  }\n\n  export const avgPoolConfig: KernelConfig = {\n    kernelName: AvgPool,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: avgPool as {} as KernelFunc\n  };\n\n  "/**\n  * @license\n  * Copyright 2019 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the\n  "License");\n  * you may not use this file except in compliance with the License.\n  * You may obtain a copy of the\n  License at\n  *\n  * http://www.apache.org/licenses/LICENSE-2.0\n  *\n  * Unless required by applicable law or

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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function reshape(\n  args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n  util.assert(\n    xSize === util.sizeFromShape($shape),\n    () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n      `shape must have the same number of elements.`);\n  // Backend needs to track refCount for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n  kernelFunc: reshape as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nlet wasmBatchMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number', // a_id\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n    'array', // b_shape\n    'number', // b_shape.length\n    'number', // transpose_a\n    'number', // transpose_b\n    'number' // out_id\n  ]);\n  function batchMatMul(args: {\n    inputs: BatchMatMulInputs,\n    backend: BackendWasm,\n    attrs: BatchMatMulAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {a, b} = inputs;\n    const {transposeA, transposeB} = attrs;\n    if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n      throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n    }\n    const aRank = a.shape.length;\n    const bRank = b.shape.length;\n    const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n    const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n    const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n    const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n    const outerDimsA = a.shape.slice(0, -2);\n    const outerDimsB = b.shape.slice(0, -2);\n    const batchDimA = util.sizeFromShape(outerDimsA);\n    const batchDimB = util.sizeFromShape(outerDimsB);\n    const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n    util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions must either be the ` +\n        `same or at least one input batch dimension must be 1. Got input ` +\n        `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n    const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n    const outShape =\n      outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n    util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n        `(${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n        `(${b.shape} and transposeA=${transposeA} ` +\n        `and transposeB=${transposeB}` +\n        ` must match.`);\n    const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n    const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n      [batchDimB, innerShapeB, outerShapeB];\n    // The rest of the implementation is designed to operate on rank-3 tensors\n    const a3d = reshape({inputs: {x: a}, backend, attrs:
```



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{\n  slice2d(\n    xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n    size_ as [number, number]);\n } else if (rank === 3) {\n  slice3d(\n    xVals as TypedArray, xStrides[0], xStrides[1],\n    outVals,\n    begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)\n {\n  slice4d(\n    xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n    begin_ as [number, number, number, number],\n    size_ as [number, number, number, number]);\n } else {\n  const res =\n  sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n  outVals.set(res);\n } \n\n return\n out;\n}\n\nfunction slice2d(\n  xVals: backend_util.TypedArray, xStride: number,\n  outVals: backend_util.TypedArray, begin: [number, number],\n  size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI; i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]),\n    outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n  xVals: backend_util.TypedArray, xStride1:\n  number, xStride2: number,\n  outVals: backend_util.TypedArray, begin: [number, number, number],\n  size: [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i <\n  endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]),\n      outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n  xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n  xStride3: number, outVals: backend_util.TypedArray,\n  begin: [number, number, number, number],\n  size: [number, number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK + size[2];\n  const beginL = begin[3];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++)\n    {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +\n        beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]),\n        outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as { } as KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  

http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
  

===== \n
*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,\nKernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport\n {reshape} from './Reshape';\n\nimport {slice} from './Slice';\n\nimport {transpose} from './Transpose';\n\nfunction\n batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs:\n  BatchToSpaceNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,\n  crops} = attrs;\n  const prod = blockShape.reduce((a, b) => a * b);\n  const reshaped =\n  backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted =\n  backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted =\n  backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords =\n  backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize =\n  backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n  const xReshaped = reshape({inputs:\n  {x}, backend, attrs: {shape: reshaped}});\n  const xTransposed =\n  transpose({inputs: {x: xReshaped}, backend,\n  attrs: {perm: permuted}});\n  const xTransposedReshaped = reshape(\n  {inputs: {x: xTransposed}, backend,\n  attrs: {shape: reshapedPermuted}});\n  const result = slice({\n  inputs: {x: xTransposedReshaped},\n  backend,\n  attrs: {begin: sliceBeginCoords, size: sliceSize}\n  });\n  backend.disposeData(xReshaped.dataId);\n  backend.disposeData(xTransposed.dataId);\n  backend.disposeData(xReshaped.dataId);\n  return

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result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n  TensorInfo {\n  const {inputs: {x}, attrs: {dtype}, backend} = args;\n  const out = backend.makeOutput(x.shape, dtype);\n  const inVals = backend.toArrayFromHeap(x);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n\n*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number', // x_id\n    'number', // min\n    'number', // max\n    'number' // out_id\n  ]);\n\n  function clip(args: {\n    inputs: ClipByValueInputs,\n    backend: BackendWasm,\n    attrs: ClipByValueAttrs\n  }) {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {clipValueMin, clipValueMax} = attrs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmClip(xId, clipValueMin, clipValueMax, outId);\n    return out;\n  }\n\n  export const clipByValueConfig: KernelConfig = {\n    kernelName: ClipByValue,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: clip as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
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License.\n *

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=====
*\n\nimport { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { concatImplCPU } from
'./kernel_utils/shared';\n\nimport { identity } from './Identity';\n\nimport { reshape } from './Reshape';\n\n\nexport function
concat(\n  args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend}
= args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length ===
1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes =
$inputs.map(t => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype ===
'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-
dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than
the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by
collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t},
backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals:
backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concat 2d tensors along axis=1.\n    outShape =\nbackend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat =
inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n      inputsValShapes, outShape,\n      inputs[0].dtype,\n      simplyConcat) as string[];\n\n    const finalOutShape =\nbackend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n    out.shape = finalOutShape;\n    const
outData = backend.dataIdMap.get(out.dataId);\n    outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n    return out;\n  }\n\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n  let sumInnerDims =
0;\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n    sumInnerDims += innerDim;\n    return innerDim;\n  });\n  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n  const outVals = backend.typedArrayFromHeap(out);\n  for (let b = 0; b <
batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const
innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n      outVals.set(vals, outOffset);\n      outOffset += innerDim;\n    }\n  }\n  return
out;\n}\n\n\nexport const concatConfig: KernelConfig = {\n  kernelName: Concat,\n  backendName: 'wasm',\n  kernelFunc: concat as {} as KernelFunc,\n};\n\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\n\nimport { backend_util, util } from '@tensorflow/tfjs-core';\n\nexport function concatImpl(inputs, outShape, dtype,
simplyConcat) {\n  const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n  if
(simplyConcat && dtype !== 'string') {\n    // Use built-in TypedArray.set() method for speed.\n    let offset =
0;\n    inputs.forEach(input => {\n      const size = util.sizeFromShape(input.shape);\n      outVals.set(input.vals, offset);\n      offset += size;\n    });\n  } else {\n    let colOffset = 0;\n    inputs.forEach(input => {\n      const decodedData = dtype === 'string' ?\n
```


7XG4gICAgAW5wdXRzLmZvckVhY2goaW5wdXQgPT4ge1xuICAgICAgY29uc3Qgc2l6ZSA9IHV0aWwuc2l6ZU
UzYb21TaGFwZShpbmB1dC5zaGFwZSk7XG5cbiAgICAgIChdXRWYwXzIGFzIFR5cGVkQXJyYXkpLnNldCh
pbmB1dC52YWxzIGFzIFR5cGVkQXJyYXksIG9mZnNldCk7XG4gICAgICBvZmZzZXQgKz0gc2l6ZTtcbiAgICB
9KTtcbiAgfSB1bHNIIHtcbiAgICBsZXQgY29sT2Zmc2V0ID0gMDtcbixuICAgIGlucHV0cy5mb3JFYWNoKGluc
HV0ID0+IHtcbiAgICAgIGNvbnN0IGRlY29kZWREYXRhID0gZHR5cGUgPT09ICdzdHJpbmcmID9cbiAgICAgI
CAgICBiYWNrZW5kX3V0aWwuc2l6ZSA9IHV0aWwuc2l6ZSA9IHV0aWwuc2l6ZSA9IHV0aWwuc2l6ZSA9IHV0aWwuc2l6Z
JyYXlbXSkglxuCgICAgICAgIGlucHV0LnZhbHMgYXMGVHlwZWRCbnJheTtcbixuICAgICAgbGV0IHRJZ
HggPSAWO1xuXG4gICAgICBmb3IgKGxldCByY3cgPSAWOyYyY3cgPCBpbmB1dC5zaGFwZVswXTsgKytyb3cp
IHtcbiAgICAgICAgY29uc3QgcGVzSWR4ID0gcm93ICogb3V0U2hhcGVbMV0gKyBjb2xPZmZzZXQ7XG4gICAg
gICAgIGZvciAobGV0IGNvbCA9IDA7IGNvbCA8IGlucHV0LnNoYXB1WzFdoYArK2NvbCkge1xuICAgICAgIC
AgIG91dFZhbHNbcmVzSWR4ICsgY29sXSA9IGRlY29kZWREYXRhW3RlZGRK107XG4gICAgICAgIH1cbiA
gICAgIH1cbixuICAgICAgY29sT2Zmc2V0ICs9IGlucHV0LnNoYXB1WzFdoYArK2NvbCkge1xuICAgICAgICAgIC
mV0dXJuIG91dFZhbHM7XG59XG4iXX0=","/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', // dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n\n  function conv2d(\n    args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n    const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false, $dataFormat);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels = convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend Conv2D does not support dataFormat: " +\n        `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n    }\n    const out = backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight,
```

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dilationWidth, strideHeight, strideWidth, inputChannels,\n  outputChannels, outId);\n return out;\n}\n\nexport\nconst conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: conv2d as { } as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *  
 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,\n  KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from\n './backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,\n  filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n  outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,\n  topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n  xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:\n  number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:\n  BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n    'number', // dyId\n    'number', // filterId\n    'number', // batchSize\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', // inHeight\n    'number', // inWidth\n    'number', // inChannels\n    'number', // outHeight\n    'number', // outWidth\n    'number', // outChannels\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', // topPad\n    'number', // leftPad\n    'number', // fltS0\n    'number', // fltS1\n    'number', // fltS2\n    'number', // xBatchStride\n    'number', // xRowStride\n    'number', // xColStride\n    'number', // xChannelStride\n    'number', // yBatchStride\n    'number', // yRowStride\n    'number', // yColStride\n    'number', // yChannelStride\n    'number', // outId\n  ]);\n\n  function conv2DBackpropInput(args: {\n    backend:\n      BackendWasm,\n    inputs: Conv2DBackpropInputInputs,\n    attrs: Conv2DBackpropInputAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { dy, filter } = inputs;\n    const { strides, pad, dataFormat,\n      dimRoundingMode, inputShape } = attrs;\n\n    const dilations = 1;\n    const $dataFormat =\n      backend_util.convertConv2DDataFormat(dataFormat);\n    const convInfo = backend_util.computeConv2DInfo(\n      inputShape, filter.shape as [number, number, number, number], strides,\n      dilations, pad, dimRoundingMode,\n      false /* depthwise */, $dataFormat);\n    const {\n      batchSize,\n      filterHeight,\n      filterWidth,\n      inChannels,\n      inHeight,\n      inWidth,\n      outChannels,\n      outHeight,\n      outWidth,\n      strideHeight,\n      strideWidth\n    } =\n      convInfo;\n\n    const topPad = filterHeight - 1 - convInfo.padInfo.top;\n    const leftPad = filterWidth - 1 -\n      convInfo.padInfo.left;\n\n    const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n    const dxStrides =\n      util.computeStrides(convInfo.inShape);\n    const dyStrides = util.computeStrides(dy.shape);\n    const [fltS0, fltS1,\n      fltS2] = util.computeStrides(filter.shape);\n    const xBatchStride = dxStrides[0];\n    const xRowStride =\n      isChannelsLast ? dxStrides[1] : dxStrides[2];\n    const xColStride = isChannelsLast ? dxStrides[2] : 1;\n    const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n    const yBatchStride = dyStrides[0];\n    const yRowStride =\n      isChannelsLast ? dyStrides[1] : dyStrides[2];\n    const yColStride = isChannelsLast ? dyStrides[2] : 1;\n    const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n    const out = backend.makeOutput(convInfo.inShape,\n      'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const dyId =\n      backend.dataIdMap.get(dy.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    wasmConv2DBackpropInput(\n      dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n      inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n      topPad, leftPad, fltS0, fltS1, fltS2,\n      xBatchStride, xRowStride,\n      xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n      yChannelStride, outId);\n    return out;\n  }\n\n  export const conv2DBackpropInputConfig: KernelConfig = {\n    kernelName: Conv2DBackpropInput,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc:
```

conv2DBackpropInput as { } as KernelFunc\n};\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", /**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest = 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n    'number', // out id\n  ]);\n}\n\nfunction cropAndResize(args: {\n  backend: BackendWasm,\n  inputs: CropAndResizeInputs,\n  attrs: CropAndResizeAttrs\n}): TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { method, extrapolationValue, cropSize } = attrs;\n  const { image, boxes, boxInd } = inputs;\n  const numBoxes = boxes.shape[0];\n  const [cropHeight, cropWidth] = cropSize as [number, number];\n  const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n  let imagesData = backend.dataIdMap.get(image.dataId);\n  let castedData;\n  if (image.dtype !== 'float32') {\n    castedData = cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n    imagesData = backend.dataIdMap.get(castedData.dataId);\n  }\n  const imagesId = imagesData.id;\n  const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n  const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n  const out = backend.makeOutput(outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n  wasmCropAndResize(\n    imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n    cropWidth,\n    InterpolationMethod[method as { } as keyof typeof InterpolationMethod],\n    extrapolationValue, outId);\n  if
```

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(castedData != null) {\n  backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
'./types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n      finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number' //
dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,
exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n  util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis
to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n  const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n    permutedOutId, CppDType[x.dtype]);\n  // transpose data back if permuted\n  let out =
permutedOut;\n  if (permutation !== null) {\n    const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n      {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n    backend.disposeData(permutedX.dataId);\n  }\n  backend.disposeData(permutedOut.dataId);\n }\n\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as {} as
KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n
'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n
  ]);\n}

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'number', // outId\n ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n  const outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth = inputDepth / (blockSize * blockSize);\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize, outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n  const out = backend.makeOutput(outputShape, 'float32');\n  const xData = backend.dataIdMap.get(x.dataId);\n  const xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n  const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  const wasmDepthToSpace = (\n    xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n  return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\n  DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n  padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n  dilationHeight: number, dilationWidth: number, strideHeight: number,\n  strideWidth: number, inputChannels: number, outputChannels: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n    backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n      'number', // xId\n      'number', // batchSize\n      'number', // inputHeight\n      'number', // inputWidth\n      'number', // filterId\n      'number', // filterHeight\n      'number', // filterWidth\n      'number', // padTop\n      'number', // padRight\n      'number', // padBottom\n      'number', // padLeft\n      'number', // isSamePad\n      'number', // dilationHeight\n      'number', // dilationWidth\n      'number', // strideHeight\n      'number', // strideWidth\n      'number', // inputChannels\n      'number', // outputChannels\n      'number', // outId\n    ]);\n\n  function depthwiseConv2d(args: {\n    inputs: DepthwiseConv2dNativeInputs,\n    backend: BackendWasm,\n    attrs: DepthwiseConv2dNativeAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n    const {x, filter} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n    const {strides, dilations, pad, dimRoundingMode} = attrs;\n    const $dilations = dilations === null ? [1, 1] : dilations;\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n      ($dilations as number | [number, number]), pad, dimRoundingMode,\n      true /* depthwise */);\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels =
```

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convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n", "/*\n * @license\n
* Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from
'/Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n
backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =

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attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if
(dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n
() => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim
+ 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n
backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out =
backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as
number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName:
'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch:
number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
imageWidth\n 'number', // numChannels\n 'number', // outId\n ]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as
KernelFunc,\n setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n"/**\n *

```

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```
=====\n*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n  createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n  backend: BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId = backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n  const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmBatchNorm(xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName: FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as {\n    KernelFunc\n  };,\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {FusableActivation} from './types';\nlet wasmFusedConv2d: (\n  xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight: number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels: number, activation: number,\n  preluActivationWeightsId: number,
```

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leakyreluAlpha: number, outId: number) =>\n    void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\n\nfunction
fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n
FusableActivation[activation as {}] as keyof typeof FusableActivation);\n if (fusedActivation == null) {\n throw
new Error(\n ` ${activation} activation not yet supported for FusedConv2D ` +\n ` in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels
(${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support
dataFormat:` +\n ` ${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet

```

```

wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n
filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n
backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\nfunction
fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs:
FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias,
preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n
dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n  const convInfo =
backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n  const fusedActivation =\n    FusableActivation[activation as ]\n  as key of typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n      `${activation}\n
activation not yet supported for FusedDepthwiseConv2D` +\n      `in the wasm backend.`);\n  }\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
outputChannels = convInfo.outChannels;\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n        `rank ${biasData.shape.length}.`);\n    }\n
if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n        `FusedDepthwiseConv2D bias shape\n
(${biasData.shape}) does not ` +\n        `match the number of output channels (${outputChannels}).`);\n    }\n
biasId = biasData.id;\n  }\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth =
convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const
padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n      `wasm backend FusedDepthwiseConv2D does not support\n
dataFormat:` +\n      `${dataFormat}`. Please use 'NHWC'.`);\n  }\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n    0 :\n  backend.dataIdMap.get(preluActivationWeights.dataId).id;\n  wasmFusedDepthwiseConv2d(\n    xId, batchSize,\n
inHeight, inWidth, filterId, filterHeight, filterWidth,\n    biasId, padTop, padRight, padBottom, padLeft,\n
isSamePad, dilationHeight,\n    dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n  return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName: FusedDepthwiseConv2D,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n"/**\n *
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```

WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n    'number', // sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}): \n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} = inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params, indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes, outId);\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

```
=====\n*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from './Reshape';\nimport {CppType} from './types';\n\nlet wasmGather: (\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize: number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n    'number', // xId\n    'number', // dtype\n    'array', // xStrides\n    'number', // stridesSize\n    'number', // indicesId\n    'number', // batchSize\n    'array', // outStrides\n    'number' // outId\n  ]);\n}\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x, indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n    const index = indicesVals[i];\n    util.assert(\n      index <= axisDim - 1 && index >= 0,\n      () =>\n        `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]);\n  }\n\n  const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    attrs: {\n      shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize],\n      backend\n    }\n  });\n  const flattenOutputShape = [\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n  ];\n\n  const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n\n
```

```

return out;\n } \n const stridesSize = flattenX.shape.length - 1;\n\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n"/**\n
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
===== \n
*/\n\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n"/**\n
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*/\n\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig }
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n"/**\n
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*/\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n ]);\n}\n\nexport function leakyRelu(\n args: \n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm});\n\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either
float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
!== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n }\n}\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n

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backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as { } as KernelFunc,\n);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
```

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'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n  'number', // x_id\n
'number', // dtype\n  'number', // reduce_size\n  'number', // out_id\n  ]);\n}\n\nfunction max(args: {backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {reductionIndices: axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes,
inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n  input = transposed;\n  inputId =
transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n  // dispose of the
transposed tensor.\n  backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n  // reshape\n  const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n  out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: max as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n
createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n", "/**\n * @license\n * Copyright 2019 Google
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http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n  'number', // xId\n  'number', // batchSize\n  'number', //
inputHeight\n  'number', // inputWidth\n  'number', // filterHeight\n  'number', // filterWidth\n  'number', //
padTop\n  'number', // padRight\n  'number', // padBottom\n  'number', // padLeft\n  'number', //
dilationHeight\n  'number', // dilationWidth\n  'number', // strideHeight\n  'number', // strideWidth\n  'number',
// inputChannels\n  'number', // outputChannels\n  'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:

```



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{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n
cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed

```

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tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype
!=='float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n
'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n
}\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape,
axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape,
input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if
(inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n
}\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*/\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode { \n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction\n  setup(backend: BackendWasm) {\n    wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n      'number', // xId\n      'array', // x.shape\n      'number', // x.shape.length\n      'number', // x.dtype\n      'array', // pre-paddings\n      'array', // post-paddings\n      'number', // mode\n      'number', // outId\n    ]);\n  }\n\nfunction\n  mirrorPad(args: {\n    inputs: MirrorPadInputs,\n    backend: BackendWasm,\n    attrs: MirrorPadAttrs\n  }) {\n    const\n      { inputs: { x }, backend, attrs: { paddings, mode } } = args;\n\n    const outShape = paddings.map(\n      (p, i) => p[0] /*\n        beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out =\n      backend.makeOutput(outShape, x.dtype);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const\n      xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    const prePaddingsFlat =\n      paddings.map(padTuple => padTuple[0]);\n\n    const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n\n    const prePaddingsBytes =\n      new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n\n    const\n      postPaddingsBytes =\n      new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n    wasmMirrorPad(\n      xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n      postPaddingsBytes,\n      MirrorPaddingMode[mode], outId);\n\n    return out;\n  }\n\nexport const mirrorPadConfig: KernelConfig = {\n  kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as { } as KernelFunc,\n  setupFunc:\n  setup\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
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=====\n\n*/\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2020 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
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*\n\nimport {BackendWasm} from './backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`\n */\n\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset:
number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const
pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const
pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n
backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
 './backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n  'number', // Result*\n  [\n    'number', // boxesId\n    'number', // scoresId\n
    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n
  ]);\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold,
maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const
resOffset =\n    wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n  const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n  backend.wasm._free(pValidOutputs);\n\n  const selectedIndicesTensor
=\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n  kernelName:
NonMaxSuppressionV3,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc as {} as
KernelFunc,\n};\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
 './backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
  padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =

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backend.wasm.cwrap(\n  NonMaxSuppressionV4,\n  'number', // Result*\n  [\n  'number', // boxesId\n  'number', // scoresId\n  'number', // maxOutputSize\n  'number', // iouThreshold\n  'number', // scoreThreshold\n  'bool', // padToMaxOutputSize\n  ]);\n\nfunction nonMaxSuppressionV4(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n    attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const resOffset = wasmFunc(\n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n    padToMaxOutputSize);\n\n  const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V4, we have to delete it from the heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n    backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =\n    backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n  kernelName: NonMaxSuppressionV4,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: nonMaxSuppressionV4 as {\n    as KernelFunc,\n  };,\n  "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,\n  NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n  (boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n   number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', // scoreThreshold\n    'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend: BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[] {\n    const {backend, inputs, attrs} = args;\n    const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} =\n      attrs;\n    const {boxes, scores} = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using validOutputs for V5, we have to delete it from the\n    // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const selectedIndicesTensor =\n      backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n    const selectedScoresTensor =\n      backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n    return [selectedIndicesTensor, selectedScoresTensor];\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =\n    {\n      kernelName: NonMaxSuppressionV5,\n      backendName: 'wasm',\n      setupFunc: setup,\n      kernelFunc: kernelFunc as {\n        as KernelFunc,\n      };,\n      "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the

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License.\n *

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=====\n
*\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2020
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
 may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
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*\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmOneHot: (\n  indicesId: number, depth:
 number, onValue: number, offValue: number,\n  outId: number) => void;\nfunction setup(backend:
 BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n
 'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n}\nfunction
 oneHot(\n  args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n  const {inputs,
 backend, attrs} = args;\n  const {indices} = inputs;\n  const {depth, onValue, offValue} = attrs;\n\n  const out =
 backend.makeOutput([...indices.shape, depth], 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n  return out;\n}\n\nexport const oneHotConfig:
 KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: oneHot as
 {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
 Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
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*\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport
 {BackendWasm} from '../backend_wasm';\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
 BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n
  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const
 onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as
 {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
 Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
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*\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concat} from './Concat';\nimport
 {expandDims} from './ExpandDims';\nexport function pack(\n  args: {inputs: PackInputs, backend:
 BackendWasm, attrs: PackAttrs}):\n  TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {axis} =
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attrs;\n\n if (inputs.length === 1) {\n  return expandDims(\n    {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n };\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n
util.assertShapesMatch(\n  shape, t.shape,\n  'All tensors passed to stack must have matching shapes');\n
util.assert(\n  dtype === t.dtype,\n  () => 'All tensors passed to stack must have matching dtypes');\n });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n  const
expandedT =\n    expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n
intermediateTensorInfos.push(expandedT);\n  return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc;\n};\n\n"/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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\n
*/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // x.dtype\n
'array', // pre-paddings\n  'array', // post-paddings\n  'number', // constantValue\n  'number', // outId\n
]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map(\n  (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n  // Short-
circuit the computation, since x doesn't have value, only\n  // the shape is used to compute output shape to pad.\n
return fill({\n  backend,\n  attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const
xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const
outTensorData = backend.dataIdMap.get(out.dataId);\n  const outId = outTensorData.id;\n\n  const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n  new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmPadV2(\n  xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n  postPaddingsBytes, constantValue, outId);\n  return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as
KernelFunc,\n setupFunc: setup;\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, Prelu, PreluInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast } from './Cast';\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' // out_id\n  ]);\n  function prelu(args: { inputs: PreluInputs, backend: BackendWasm }) {\n    const { inputs, backend } = args;\n    const { x, alpha } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if (input.dtype !== 'float32') {\n      castedInput = cast({ backend, inputs: { x }, attrs: { dtype: 'float32' }});\n      inputId = backend.dataIdMap.get(castedInput.dataId).id;\n    }\n    const out = backend.makeOutput(x.shape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n    if (input.dtype !== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n    return out;\n  }\n  export const preluConfig: KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {\n      KernelFunc\n    },\n  },\n  "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *"
```

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmProd: (\n  xId: number, reduceSize: number, dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs: ProdAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n    const { transposed, axes, originalAxes, inputWasTransposed } =\n      permuteAxesAndTranspose(x, axis, backend);\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length, input.shape.length);\n      }\n    }\n    backend_util.assertAxesAreInnerMostDims(\n      'prod', reductionAxes, input.shape.length);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n    const out = backend.makeOutput(outShape, input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n    }\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n    return out;\n  }\n  export const prodConfig: KernelConfig = {\n    kernelName: Prod,\n    backendName: 'wasm',\n
```


UUFDDeMsTUFBTSxDQUFDLENBQUMsQ0FBQyxHQUFHLE1BQU0sQ0FBQyxDQUFDLEdBQUcsQ0FBQy
xDQUFDLEdBQUcsSUFBSsxDQUFD00tBQ2xDO0IBQ0QsT0FBTyxNQUFNLENBQUM7QUFDaEIsQ0FBQyI
sInNvdXJjZXNDb250ZW50IjpbLi8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMT
EMuIEFsCBSaWdodHMgUmVzZXJjZXJ2ZWwQuXG4gKiBmaWNIbnNIZCB1bmRlciB0aGUgQXBhY2hlIEpY2Vuc
2UsIFZlcnNpb24gMi4wICh0aGUgXCJMaWNIbnNlXCIP01xuCogeW91IG1heSBub3QgdXNlIHROaXMgZmlsZ
SBleGNlcHQgaW4gY29tcGxpYW5jZSB3aXRoIHRoZSBMaWNIbnNlLlxuICogWW91IG1heSBvYnRhaW4gYSB
jb3B5IG9mIHRoZSBMaWNIbnNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJ
Q0VOU0UtMi4wXG4gKlxuICogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUGbGF3IG9yIGFncmVIZC
B0byBpbiB3cm10aW5nLCBzb2Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIEpY2Vuc2UgaXMgZ
GlzdHJpYnV0ZWQgb24gYW4gXCJBUEYBU1wiEJBU0ITLFXuICogV0IUSE9VVCBXXVJSQU5USUVTIE9SIE
NPTkRjVEIPTIMgT0YgQU5ZIEtJTkQsIGVpdGhlcjBlcHByZXNzIG9yIGltcGxpZWQuXG4gKiBTZWUgdGhlIE
xpY2Vuc2UgZm9yIHRoZSBzcGVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybWlzc2l2bnMgYW5kXG4
gKiBsaW1pdGF0aW9ucyB1bmRlciB0aGUgTGljZW5zZS5cbiAqID09PT09PT09PT09PT09PT09PT09PT09PT
T09PT09
0IHtEYXRhVHlwZU1hcCwgZXRpbH0gZnJvbSAnQHRlbnNvcmsZsb3cvdGZqcyljb3JlZtcblxuZXhwb3J0IGZ1bm
N0aW9uIHJhbmdlSW1wbChcbiAgICBzdGFydDogbnVtYmVycyLCBzdG9wOiBudW1iZXIsIHN0ZXA6IG51bWJlci
xcbiAgICBkdHlwZTogJ2Zsb2F0MzInfCdpbnQzMicpOiBEYXRhVHlwZU1hcFsnZmxvYXQzMicgcGFCAnaW50Mz
InXSB7XG4gIGNvbnN0IHNBhbWVTdGFydFN0b3AgPSBzdGFydCA9PT0gc3RvcDtcbiAgY29uc3QgaW5jcmVhc
2luZ1JhbmdlTmVnYXRpdmVTdGVwID0gc3RhcncGqPCBzdG9wICYmIHN0ZXAqPCAwO1xuICBjb25zdCBkZ
WNyZWZfaW5nUmFuZ2VQb3NpdG12ZVN0ZXAgPSBzdG9wIDwgc3RhcncGqJiYgc3RlcCA+IDE7XG5cbiAga
WYgKHNhbWVTdGFydFN0b3AgfHwgaW5jcmVhc2luZ1JhbmdlTmVnYXRpdmVTdGVwIHx8XG4gICAgICBk
ZWNyZWZfaW5nUmFuZ2VQb3NpdG12ZVN0ZXApIHtcbiAgICBzYXR1cm4gdXRpbC5tYWtlWmVyb3NueXB
lZEFycmF5KDAsIGR0eXB1KTtcbiAgfVxuXG4gIGNvbnN0IG51bUVsZW1lbnRzID0gTWF0aC5hYnMoTWF0aC
5jZWlsKChzdG9wIC0gc3RhcncGqIC8gc3RlcCkqO1xuCjBjb25zdCB2YWx1ZXMGPSB1dGlsLm1ha2VaZXJvc1R
5cGVkQXJyYXkobnVtRWxlbWVudHM5IGR0eXB1KTtcbiAgICBpZiAoc3RvcCA8IHN0YXJ0ICYmIHN0ZXAqP
T09IDEpIHtcbiAgICAvLyBBdXRvIGFkanVzdCB0aGUgc3RlcDdzIHNpZ24gaWYgaXQgaGFzbid0IGJlZ4gc2V
0XG4gICAgLy8gKG9yIHdhcyBzZXQgdG8gMSlcbiAgICBzdGVwID0gLTE7XG4gIH1cbiAgICBzYXR1cm4gZmFsdWVzO1xufVxuIl19"
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```
=====\n*\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from  
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\ncreateBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n",/*\n * @license\n * Copyright 2019 Google LLC.  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from  
'./unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n",/*\n * @license\n
```

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```
=====\n*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/**\n *  
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the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,  
util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from  
 './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters:  
number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =  
backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', //  
oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', //  
newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n}\nfunction  
resizeBilinear(args: {\n  backend: BackendWasm,\n  inputs: ResizeBilinearInputs,\n  attrs: ResizeBilinearAttrs\n}):  
TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {images} = inputs;\n  const {alignCorners,  
halfPixelCenters, size} = attrs;\n  const [newHeight, newWidth] = size;\n  const [batch, oldHeight, oldWidth,  
numChannels] = images.shape;\n  const outShape = [batch, newHeight, newWidth, numChannels];\n  let xData =  
backend.dataIdMap.get(images.dataId);\n  let castedData;\n  if (xData.dtype !== 'float32') {\n    castedData =\n    cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n    xData =  
backend.dataIdMap.get(castedData.dataId);\n  }\n  const xId = xData.id;\n  const out =  
backend.makeOutput(outShape, 'float32');\n  if (util.sizeFromShape(images.shape) === 0) {\n    return out;\n  }\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmResizeBilinear(\n    xId, batch, oldHeight,  
oldWidth, numChannels, newHeight, newWidth,\n    alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n  if  
(castedData != null) {\n    backend.disposeData(castedData.dataId);\n  }\n  return out;\n}\n\nexport const  
resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'wasm',\n  setupFunc:  
setup,\n  kernelFunc: resizeBilinear as {} as KernelFunc\n};\n", "/**\n *  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
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```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from  
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from  
 './Identity';\nimport {reshape} from './Reshape';\nlet wasmReverse: (\n  xId: number, axes: Uint8Array,  
axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\nfunction
```

```

setup(backend: BackendWasm) {
  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n
'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number'
// out_id\n ]);\n\n\nexport function reverse(\n  args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {dims} =
attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return
identity({inputs: {x}, backend});\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n\n    const reshaped =\n      reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n  backendName: 'wasm',\n  kernelFunc: reverse as {} as KernelFunc,\n  setupFunc:
setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight:
number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n
fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', //
batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', //
radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n
'number', // outId\n ]);\n\n\nexport function rotateWithOffset(args: {\n  inputs: RotateWithOffsetInputs,\n
backend: BackendWasm,\n  attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {image} = inputs;\n  const {radians, fillValue, center} = attrs;\n\n  const out =
backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n  const [centerX, centerY] =\n    backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n  const fillIsBlack = fillValue === 0;\n  const fullOpacityValue = 255;\n\n  const fillValues =
typeof fillValue === 'number' ?\n    [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n
[...fillValue, fullOpacityValue];\n  const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
  wasmRotate(\n    imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n    centerY,
fillBytes, fillValues.length, outId);\n  return out;\n}\n\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n  backendName: 'wasm',\n  kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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```
*/\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', // sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n\n  function scatterNd(\n    args: {\n      backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs\n    }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices, updates} = inputs;\n    const {shape} = attrs;\n\n    const out = backend.makeOutput(shape, updates.dtype);\n    if (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n\n    const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n\n    const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n\n    const updatesData = backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n\n    const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize, stridesBytes, outputSize, outId);\n\n    return out;\n  }\n\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as KernelFunc\n  };\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number, offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n  ]\n
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'number', // offset\n 'number', // outId\n ]);\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 :\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {}
as KernelFunc,\n setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*
void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out
= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n\n"/**\n * @license\n
* Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n
waswFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n
'number', // channels\n 'number' // batch\n ]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} =
args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape,

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logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return\n out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,\n SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {padV2Config} from\n './PadV2';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nfunction\n spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs:\n SpaceToBatchNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,\n paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<number,\n number> = [[0, 0]];\n completePaddings.push(...(paddings as Array<number, number>));\n\n for (let i = 1 +\n blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const paddedX =\n padV2Config.kernelFunc({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue:\n 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape,\n blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs:\n ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const\n paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs:\n TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n TransposeAttrs = {perm:\n permutedReshapedPaddedPermutation};\n const paddedXT =\n transpose({inputs: transposeInputs, backend,\n attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const\n resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n {inputs:\n resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return\n result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-\n core';\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from\n './backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:\n SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const\n {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes =

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alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName:
Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n  xId: number, xStridesBytes: Uint8Array,
xRank: number,\n  beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n  outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n
'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //
outShapeLength\n 'number', // outId\n ]);\n}\n\nexport function stridedSlice(args: {\n  backend: BackendWasm,\n
inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n
newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n    finalShape,\n    isIdentity,\n
sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n  } =\n    slice_util.sliceInfo(\n
      x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n        newAxisMask, shrinkAxisMask);\n\n
let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus reshape\n    result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 || isSimpleSlice) {\n    // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n    util.assert(\n      x.shape.length >= 1,\n      () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n    result =\n      reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n    backend.disposeData(sliced.dataId);\n  } else {\n    const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const
xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n    const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n    const
outputShapeBytes =\n      new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes =
new Uint8Array(\n      new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n      xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n      outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n    backend.disposeData(out.dataId);\n
}\n\n  return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n
backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: stridedSlice as {} as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n
'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n ]);\n}\n\nfunction sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}): \n TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n  inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was
not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =
transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length,\n
input.shape.length);\n    }\n  }\n\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,\n
input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
const\n    newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //
x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n}\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n    CppDType[out.dtype], outId);\n  return
out;\n}\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc;\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number',
// x.shape.length\n    'number', // x.dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n}\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n
const {k, sorted} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n  const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n  const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n  const outIndices =
backend.makeOutput(outputShape, 'int32');\n  const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n  wasmTopK(\n    xId, xShapeBytes, x.shape.length,\n
CppType[x.dtype], k, sorted,\n    outValuesId, outIndicesId);\n  return [outValues, outIndices];\n
};\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
}

```

setup,\n kernelFunc: topk as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nlet wasmTransform: (\n  imageId: number, transformsId: number, isBatchTransform: boolean,\n  batch: number, outHeight: number, outWidth: number, numChannels: number,\n  imageWidth: number, imageHeight: number, strides: Uint8Array,\n  stridesLength: number, interpolationModeId: number, fillModeId: number,\n  fillValue: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n    'number', // imageId\n    'number', // transformsId\n    'bool', // isBatchTransform\n    'number', // batch\n    'number', // outHeight\n    'number', // outWidth\n    'number', // numChannels\n    'number', // imageWidth\n    'number', // imageHeight\n    'array', // strides\n    'number', // stridesLength\n    'number', // interpolationModeId\n    'number', // fillModeId\n    'number', // fillValue\n    'number' // outId\n  ]);\n}\nfunction transform(\n  args: {\n    backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs\n  }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { image, transforms } = inputs;\n  const { interpolation, fillMode, fillValue, outputShape } = attrs;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  const [outHeight, outWidth] =\n    outputShape != null ? outputShape : [imageHeight, imageWidth];\n  const outShape =\n    [batch, outHeight, outWidth,\n    numChannels] as [number, number, number, number];\n  const strides =\n    new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n  const out = backend.makeOutput(outShape, image.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const imageData = backend.dataIdMap.get(image.dataId);\n  const imageId = imageData.id;\n  const transformsData = backend.dataIdMap.get(transforms.dataId);\n  const transformsId = transformsData.id;\n  const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let fillModeId;\n  switch (fillMode) {\n    case 'constant':\n      fillModeId = 1;\n      break;\n    case 'reflect':\n      fillModeId = 2;\n      break;\n    case 'wrap':\n      fillModeId = 3;\n      break;\n    case 'nearest':\n      fillModeId = 4;\n      break;\n    default:\n      fillModeId = 1;\n      break;\n  }\n  wasmTransform(\n    imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n    outWidth, numChannels, imageWidth, imageHeight, strides,\n    image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n    outId);\n  return out;\n}\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend: BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\nexport const zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike
```

as { } as KernelFunc,\n};\n",/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

=====\n *^n//

We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}

```

from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
 {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
 {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n
  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n
  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n
  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n
  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n
  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n
  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n
  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n
  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n
  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n
  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n
  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n
  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n
  rotateWithOffsetConfig,\n  rsqrtConfig,\n  roundConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n
  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n
  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n
  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n
  zerosLikeConfig];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n\n"/**\n *
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 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n */\n\n
=====
*\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {slice} from
 './Slice';\n\nfunction unpack(\n  args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs});\n
TensorInfo[] {\n  const {inputs, backend, attrs} = args;\n  const {value} = inputs;\n  let {axis} = attrs;\n  if (axis <
  0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =
  value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n    if (i !== axis) {\n      outShape[outIndex++] = value.shape[i];\n    }\n  }\n  const outs: TensorInfo[] = new
  Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n
  for (let i = 0; i < outs.length; i++) {\n    begin[axis] = i;\n    outs[i] = slice({inputs: {x: value}, attrs: {begin, size},
  backend});\n  }\n  return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const
unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as {} as

```

KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {env} from '@tensorflow/tfjs-core';\nconst ENV = env();\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n ]));\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //\n // TODO(annxingyuan): Enable node support once this is resolved.\n //\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n try {\n //\n // Test for transferability of SABs (needed for Firefox)\n //\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n ]));\n } catch (e) {\n return false;\n }\n};\n\n",\n nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction\nGROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\nreturn HEAP8}function\nGROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\nreturn HEAPU8}function\nGROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\nreturn HEAP32}function\nGROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\nreturn HEAPU32}function\nGROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}\nreturn HEAPF64}var Module=typeof\nWasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var\nreadyPromiseResolve,readyPromiseReject;Module["ready"]=new\nPromise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var\nmoduleOverrides={};var key;for(key in\nModule){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var\nthisProgram=\.this.program\";var quit_=function(status,toThrow){throw toThrow};var\nENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var\nENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof\nwindow==="object";ENVIRONMENT_IS_WORKER=typeof\nimportScripts==="function\";ENVIRONMENT_IS_NODE=typeof process==="object\"&&typeof\nprocess.versions==="object\"&&typeof
```

```

process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\\\\\g,\"\\\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inps
ect\"]=function(){return\"[Emscripten Module object]\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error(\"The
\\\"worker_threads\\\" module is not supported in this node.js build - perhaps a newer version is needed?\");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=\"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!=\"0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in

```



```

moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"]arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"]thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"]quit_=Module[\"quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\"wasmBinary\"]wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!=\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!=\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63;if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023;if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++
]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var

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buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctor
s()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return

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hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="\file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="\tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\`both async and sync fetching of the
wasm failed\`} }catch(err){abort(err)} }function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\`function\`&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\`same-
origin\`}).then(function(response){if(!response[\"ok\"]){throw\`failed to load wasm binary file at
\`+wasmBinaryFile+\`\" }return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"T\"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\`wasm-
instantiate\`)}))}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\`wasm-instantiate\`)}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\`failed to asynchronously prepare
wasm: \`+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\`function\`&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\`function\`){return fetch(wasmBinaryFile,{credentials:\`same-
origin\`}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\`wasm streaming compile failed: \`+reason);err(\`falling
back to ArrayBuffer instantiation\`);return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports }catch(e){err(\`Module.instantiateWasm
callback failed with error: \`+e);return false }}instantiateAsync().catch(readyPromiseReject);return { }}var
ASM_CONSTS={10520:function(){throw\`Canceled!\`},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0})};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\`function\`){callback(Module);continue }var func=callback.func;if(typeof
func===\`number\`){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg
)} }else{func(callback.arg===undefined?null:callback.arg)} } }var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSIG:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADF:113,EBADR:114,EXFULL:115,ENO
A:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,

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ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),_emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emsripten_futex_wake\"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\":cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);_emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emsripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);_emsripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\":\":exit\"})}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\":\":cancelDone\"})},terminateAllThreads:function(){for(var t in

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PThread pthreads){ var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThread.pthreads={ };for(var i=0;i<PThread.unusedWorkers.length;++i){ var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){ var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeThreadData:function(pthread){ if(!pthread)return;if(pthread.threadInfoStruct){ var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.worker pthread=null },returnWorkerToPool:function(worker){ PThread.runWithoutMainThreadQueuedCalls(function(){ delete
PThread.pthreads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=undefined})),runWithoutMainThreadQueuedCalls:function(func){ GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=0;try {func()} finally { GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=1 } },receiveObjectTransfer:function(data){ },loadWasmModuleToWorker:function(worker,onFinishedLoading){ worker.onmessage=function(e){ var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){ var
thread=PThread.pthreads[d.targetThread];if(thread){ thread.worker.postMessage(e.data,d["transferList"]);} else { console.error('Internal error! Worker sent a message \''+cmd+'\' to target pthread '+d["targetThread"]+', but that thread no longer exists!')}PThread.currentProxiedOperationCallerThread=undefined;return }if(cmd===\`processQueuedMainThreadWork\`){ __emscripten_main_thread_process_queued_calls() } else
if(cmd===\`spawnThread\`){ spawnThread(e.data) } else
if(cmd===\`cleanupThread\`){ cleanupThread(d["thread"]) } else
if(cmd===\`killThread\`){ killThread(d["thread"]) } else
if(cmd===\`cancelThread\`){ cancelThread(d["thread"]) } else
if(cmd===\`loaded\`){ worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){ worker.runPthread();delete worker.runPthread } } else if(cmd===\`print\`){ out("Thread \"+d["threadId"]+"\": \"+d["text"]) } else if(cmd===\`printErr\`){ err("Thread \"+d["threadId"]+"\": \"+d["text"]) } else
if(cmd===\`alert\`){ alert("Thread \"+d["threadId"]+"\": \"+d["text"]) } else if(cmd===\`exit\`){ var
detached=worker pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker pthread.threadInfoStruct+64>>2);if
(detached){ PThread.returnWorkerToPool(worker) } } else
if(cmd===\`exitProcess\`){ try { exit(d["returnCode"]) } catch(e) { if(e instanceof ExitStatus)return;throw e } } else
if(cmd===\`cancelDone\`){ PThread.returnWorkerToPool(worker) } else
if(cmd===\`objectTransfer\`){ PThread.receiveObjectTransfer(e.data) } else
if(e.data.target===\`setimmediate\`){ worker.postMessage(e.data) } else { err("worker sent an unknown command \"+cmd) } PThread.currentProxiedOperationCallerThread=undefined };worker.onerror=function(e){ err("pthread sent an error! \"+e.filename+"\": \"+e.lineno+"\": \"+e.message) };if(ENVIRONMENT_IS_NODE){ worker.on("message",function(data){ worker.onmessage({ data: data }));worker.on("error",function(data){ worker.onerror(data) });worker.on("exit",function(data){ }) } } worker.postMessage({ "cmd":\`load\`, "urlOrBlob":Module["mainScriptUrlOrBlob"]||_scriptDir, "wasmMemory":wasmMemory, "wasmModule":wasmModule } ),allocateUnusedWorker:function(){ var pthreadMainJs=locateFile("tfjs-backend-wasm-threaded-simd.worker.js");PThread.unusedWorkers.push(new Worker(pthreadMainJs)),getNewWorker:function(){ if(PThread.unusedWorkers.length==0){ PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0]) } if(PThread.unusedWorkers.length>

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0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasnTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at:
\"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!=\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\": \"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\": \"processThreadQueu
e\"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\": \"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var

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ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){ var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index,numCallArgs,args){_emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emsripten_realloc_buffer(size){try{wasmmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmMemory.buffer);return
1}catch(e){}}function_emsripten_resize_heap(requestedSize){var
oldSize=_emsripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e

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ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=\"undefined\"?document:0,typeof window!=\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function

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_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ ext["vertexAttribDivisorANGLE"](index,divisor);};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ ext["drawArraysInstancedANGLE"](mode,first,count,primcount);};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount);};return 1 } }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){ return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ ext["deleteVertexArrayOES"](vao);};
ctx["bindVertexArray"]=function(vao){ ext["bindVertexArrayOES"](vao);};ctx["isVertexArray"]=function(vao)
{ return ext["isVertexArrayOES"](vao);};return 1 } }function __webgl_enable_WEBGL_draw_buffers(ctx){ var
ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ ctx["drawBuffers"]=function(n,bufs){ ext["drawBuffers
WEBGL"](n,bufs);};return 1 } }function
__webgl_enable_WEBGL_multi_draw(ctx){ return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_dra
w")) } }var
GL={ counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{ },offscreenCanvases:{ },timerQueriesEXT:[],programInfos:{ },stringCache:{ },unpackAlignment:4,recordError:
function recordError(errorCode){ if(!GL.lastError){ GL.lastError=errorCode } },getNewId:function(table){ var
ret=GL.counter++;for(var i=table.length;i<ret;i++){ table[i]=null }return
ret },getSource:function(shader,count,string,length){ var source="";for(var i=0;i<count;++i){ var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32)[string+i*4>>2],len<0?undefined:len }return
source },createContext:function(canvas,webGLContextAttributes){ var
ctx=canvas.getContext("webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle },registerContext:function(ctx,webGLContextAttributes){ var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={ handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx };if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){ GL.initExtensions(context) }return
handle },makeContextCurrent:function(contextHandle){ GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){ return
GL.contexts[contextHandle] },deleteContext:function(contextHandle){ if(GL.currentContext===GL.contexts[contex
tHandle])GL.currentContext=null;if(typeof
JSEvents===object)JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null },initExtensions:f
unction(context){ if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtensio
nsDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){ if(ext.indexOf("lose_context")<0&&ext.inde
xOf("debug")<0){ GLctx.getExtension(ext) } } } ),populateUniformTable:function(program){ var
p=GL.programs[program];var
ptable=GL.programInfos[program]={ uniforms:{ },maxUniformLength:0,maxAttributeLength:-

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1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)!="\"){name=name.slice(0,name.lastIndexOf("\\"));}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\\"+j+"\\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","low-power","high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){stream===1?out:err}(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iocnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iov,iocnt,pnum);var num=0;for(var i=0;i<iocnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8)[ptr+j]}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis

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+ (40 >> 2), pthread.threadInfoStruct); Atomics.store(GROWABLE_HEAP_U32(), tis + (80 >> 2), threadParams.stackSize);
Atomics.store(GROWABLE_HEAP_U32(), tis + (76 >> 2), stackHigh); Atomics.store(GROWABLE_HEAP_U32(), tis + (104 >> 2),
threadParams.stackSize); Atomics.store(GROWABLE_HEAP_U32(), tis + (104 + 8 >> 2), stackHigh); Atomics.store(GROWABLE_HEAP_U32(),
tis + (104 + 12 >> 2), threadParams.detached); var
global_libc = _emscripten_get_global_libc(); var
global_locale = global_libc + 40; Atomics.store(GROWABLE_HEAP_U32(), tis + (172 >> 2), global_locale); worker.pthread = pthread; var
msg = {"cmd": "run", "start_routine": threadParams.startRoutine, "arg": threadParams.arg, "threadInfoStruct": threadParams.pthread_ptr,
"stackBase": threadParams.stackBase, "stackSize": threadParams.stackSize}; worker.runPthread = function() { msg.time = performance.now();
worker.postMessage(msg, threadParams.transferList); if (worker.loaded) { worker.runPthread(); delete worker.runPthread } } function
_pthread_create(pthread_ptr, attr, start_routine, arg) { if (typeof SharedArrayBuffer === "undefined") { err("Current environment does not support SharedArrayBuffer, pthreads are not available!"); return
6 } if (!pthread_ptr) { err("pthread_create called with a null thread pointer!"); return 28 } var transferList = []; var
error = 0; if (ENVIRONMENT_IS_PTHREAD && (transferList.length === 0 || error)) { return
_emscripten_sync_run_in_main_thread_4(687865856, pthread_ptr, attr, start_routine, arg) } if (error) return error; var
stackSize = 0; var stackBase = 0; var detached = 0; if (attr && attr != -1) { stackSize = GROWABLE_HEAP_I32()[attr >> 2]; stackSize += 81920; stackBase = GROWABLE_HEAP_I32()[attr + 8 >> 2];
detached = GROWABLE_HEAP_I32()[attr + 12 >> 2] !== 0 } else { stackSize = 2097152 } var
allocatedOwnStack = stackBase === 0; if (allocatedOwnStack) { stackBase = _memalign(16, stackSize) } else { stackBase = stackSize; assert(stackBase > 0) } var threadInfoStruct = _malloc(228); for (var
i = 0; i < 228 >> 2; ++i) GROWABLE_HEAP_U32()[threadInfoStruct >> 2 + i] = 0; GROWABLE_HEAP_I32()[pthread_ptr >> 2] = threadInfoStruct; GROWABLE_HEAP_I32()[threadInfoStruct + 12 >> 2] =
threadInfoStruct; var
headPtr = threadInfoStruct + 152; GROWABLE_HEAP_I32()[headPtr >> 2] = headPtr; var
threadParams = { stackBase: stackBase, stackSize: stackSize, allocatedOwnStack: allocatedOwnStack, detached: detached, startRoutine: start_routine, pthread_ptr: threadInfoStruct, arg: arg,
transferList: transferList }; if (ENVIRONMENT_IS_PTHREAD) { threadParams.cmd = "spawnThread"; postMessage(threadParams, transferList) } else { spawnThread(threadParams) } return 0 } function
__pthread_testcancel_js() { if (!ENVIRONMENT_IS_PTHREAD) return; var
tb = _pthread_self(); if (!tb) return; var
cancelDisabled = Atomics.load(GROWABLE_HEAP_U32(), tb + 56 >> 2); if (cancelDisabled) return; var
canceled = Atomics.load(GROWABLE_HEAP_U32(), tb + 0 >> 2); if (canceled === 2) throw "Canceled!"; function
_emscripten_check_blocking_allowed() { if (ENVIRONMENT_IS_NODE) return; if (ENVIRONMENT_IS_WORKER) return; warnOnce("Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread") } function
__emscripten_do_pthread_join(thread, status, block) { if (!thread) { err("pthread_join attempted on a null thread pointer!"); return
ERRNO_CODES.ESRCH } if (ENVIRONMENT_IS_PTHREAD && _pthread_self() === thread) { err("Pthread
"+thread+" is attempting to join to itself!"); return ERRNO_CODES.EDEADLK } else
if (!ENVIRONMENT_IS_PTHREAD && _emscripten_main_browser_thread_id() === thread) { err("Main thread
"+thread+" is attempting to join to itself!"); return ERRNO_CODES.EDEADLK } var
self = GROWABLE_HEAP_I32()[thread + 12 >> 2]; if (self !== thread) { err("pthread_join attempted on thread
"+thread+", which does not point to a valid thread, or does not exist anymore!"); return
ERRNO_CODES.ESRCH } var
detached = Atomics.load(GROWABLE_HEAP_U32(), thread + 64 >> 2); if (detached) { err("Attempted to join thread
"+thread+", which was already detached!"); return
ERRNO_CODES.EINVAL } if (block) { _emscripten_check_blocking_allowed() } for (;) { var
threadStatus = Atomics.load(GROWABLE_HEAP_U32(), thread + 0 >> 2); if (threadStatus === 1) { var
threadExitCode = Atomics.load(GROWABLE_HEAP_U32(), thread + 4 >> 2); if (status) GROWABLE_HEAP_I32()[sta

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tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_P
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator==="object")return navigator["hardwareConcurrency"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={"e":__assert_fail,"r":__call_main,"x":_emscripten_notify_thread_queue,"b":_abort,"y":
_emscripten_asm_const_int,"j":_emscripten_conditional_set_current_thread_status,"d":_emscripten_futex_wait,
"c":_emscripten_futex_wake,"f":_emscripten_get_now,"p":_emscripten_memcpy_big,"A":_emscripten_num_l
ogical_cores,"u":_emscripten_receive_on_main_thread_js,"q":_emscripten_resize_heap,"v":_emscripten_set_ca
nvas_element_size,"i":_emscripten_set_current_thread_status,"s":_emscripten_set_thread_name,"w":_emscript
en_webgl_create_context,"l":_fd_close,"n":_fd_seek,"g":_fd_write,"o":initPthreadsJS,"a":wasmMemory||Mo
dule["wasmMemory"],"z":_pthread_cleanup_pop,"k":_pthread_cleanup_push,"h":_pthread_create,"m":_pthr
ead_join,"t":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module["_wasm_call_ctors"]=function(){return(__wasm_call_ctors=Module["_wasm
_call_ctors"]=Module["asm"]["B"]).apply(null,arguments)};var
_init=Module["_init"]=function(){return(_init=Module["_init"]=Module["asm"]["C"]).apply(null,arguments)};
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Mod
ule["_init_with_threads_count"]=Module["asm"]["D"]).apply(null,arguments)};var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads
_count"]=Module["asm"]["E"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=M
odule["asm"]["F"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["
asm"]["G"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"]["H"]).apply(
null,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["J"]).apply(null,arguments
)};var

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_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"][["K"]]).apply(null,arguments)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][["L"]]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][["M"]]).apply(null,arguments)};var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][["N"]]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][["O"]]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][["P"]]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][["Q"]]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][["R"]]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][["S"]]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][["T"]]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][["U"]]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][["V"]]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][["W"]]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][["X"]]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][["Y"]]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][["Z"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][["_"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][["$"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][["aa"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][["ba"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][["ca"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][["da"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][["ea"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][["fa"]]).apply(null,arguments)};var

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_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["na"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["za"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["Da"]]).apply(null,arguments)};var

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_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][_"Ea"]).apply(
null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"Fa"]).apply(
null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"Ga"]).apply(
null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"Ha"]).apply(
null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"Ia"]).apply(
null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"Ja"]).
apply(
null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"Ka"]).apply(
null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"La"]).apply(
null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=
Module["asm"][_"Ma"]).apply(
null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"Na"]).
apply(
null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWith
Offset"]=Module["asm"][_"Oa"]).apply(
null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"Pa"]).apply(
null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"Qa"]).apply(
null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Ra
"]).apply(
null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Sa"]).
apply(
null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ta"]).
apply(
null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Ua"]).apply(
null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Va"]).
apply(
null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Wa"]).apply(
null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Xa"]).apply(
null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"][_"Ya"]).apply(
null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Za"]).apply(
null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"][_"a"]).apply(
null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Sa"]).apply(
null,arguments)};var

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_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["asm"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"][["pb"]]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"][["qb"]]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][["rb"]]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"][["sb"]]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm"][["tb"]]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=

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Module["asm"][["ub"]].apply(null,arguments);var
__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=function(){return(__emscripten_call_on_t
hread=Module["__emscripten_call_on_thread"]=Module["asm"][["vb"]].apply(null,arguments));var
__emscripten_tls_init=Module["__emscripten_tls_init"]=function(){return(__emscripten_tls_init=Module["__emscrip
ten_tls_init"]=Module["asm"][["wb"]].apply(null,arguments));var
__emscripten_thread_init=Module["__emscripten_thread_init"]=function(){return(__emscripten_thread_init=Mod
ule["__emscripten_thread_init"]=Module["asm"][["xb"]].apply(null,arguments));var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["yb"]]).a
pply(null,arguments);var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["zb"]].apply(null,arguments));var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ab"
]).apply(null,arguments);var
__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=function(){return(__emscripten_stack_set
limits=Module["__emscripten_stack_set_limits"]=Module["asm"][["Bb"]].apply(null,arguments));var
__memalign=Module["__memalign"]=function(){return(__memalign=Module["__memalign"]=Module["asm"][["Cb
"]].apply(null,arguments));var
__emscripten_allow_main_runtime_queued_calls=Module["__emscripten_allow_main_runtime_queued_calls"]=1
0512;var
__emscripten_main_thread_futex=Module["__emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running..");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](""),1);doRun(),1})else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n);nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports["WasmBackendModuleThreadedSimd"] =
WasmBackendModuleThreadedSimd;\n", "\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!="undefined"?WasmBackendModule: {};var

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readyPromiseResolve,readyPromiseReject;Module[\'ready\']=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] }}var arguments_=[];var
thisProgram=\.\/this.program\';var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\'object\';ENVIRONMENT_IS_WORKER=typeof
importScripts===\'function\';ENVIRONMENT_IS_NODE=typeof process===\'object\'&&typeof
process.versions===\'object\'&&typeof
process.versions.node===\'string\';ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\'\';function
locateFile(path){if(Module[\'locateFile\']){return Module[\'locateFile\'](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\'path\').
dirname(scriptDirectory)+\'/\'}else{scriptDirectory=__dirname+\'/\'}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\'fs\');if(!nodePath)nodePath=require(\'path\');filename=n
odePath[\'normalize\'](filename);return
nodeFS[\'readFileSync\'](filename,binary?null:\'utf8\');}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\'argv\'].length>1){ thisProgram=process[\'argv\'][1].replace(/\\/g,\'/\')}arguments_=process[\'arg
v\'].slice(2);process[\'on\'](\'uncaughtException\',function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\'on\'](\'unhandledRejection\',abort);quit_=function(status){process[\'exit\'](status)};Module[\'insp
ect\']=function(){return[\'Emscripten Module object\']} }else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)} }readBinary=function readBinary(f){var
data;if(typeof readbuffer===\'function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\'binary\');assert(typeof data===\'object\');return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\'function\"){quit_=function(status){quit(status)} }if(typeof print!=\"undefined\"){if(typeof
console===\'undefined\")console={ };console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print } }else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){ scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){ scriptDirectory=document.currentScript.src }if(_scriptDir){s
criptDirectory=_scriptDir }if(scriptDirectory.indexOf(\'blob:\')!=\"0\"){ scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\'/\')+1)}else{ scriptDirectory=\'\'} }read_=function(url){ var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,false);xhr.send(null);return
xhr.responseText };if(ENVIRONMENT_IS_WORKER){readBinary=function(url){ var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,false);xhr.responseType=\'arraybuffer\';xhr.send(null);return new
Uint8Array(xhr.response)} }readAsync=function(url,onload,onerror){ var xhr=new
XMLHttpRequest;xhr.open(\'GET\',url,true);xhr.responseType=\'arraybuffer\';xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return }onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){ document.title=title } }else { var
out=Module[\'print\']||console.log.bind(console);var err=Module[\'printErr\']||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module[\'arguments\'])arguments_=Module[\'arguments\'];if(Module[\'thisProgram\'])thisProgram=

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Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},array:function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new

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Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort(\n"+what+"\n). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://^";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch=="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
\n"+wasmBinaryFile+"\n"}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming=="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil

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e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _thread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_thread_create,\"g\":_thread_join,\"i\":_sysconf};var asm=createWasm();var

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__wasm_call_ctors=Module["__wasm_call_ctors"]=function(){return(__wasm_call_ctors=Module["__wasm
_call_ctors"]=Module["asm"]["k"]).apply(null,arguments)};var
_init=Module["_init"]=function(){return(_init=Module["asm"]["l"]).apply(null,arguments)};
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Mod
ule["_init_with_threads_count"]=Module["asm"]["m"]).apply(null,arguments)};var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads
_count"]=Module["asm"]["n"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=M
odule["asm"]["o"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"
"]["p"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"]["q"]).apply(n
ull,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["s"]).apply(null,arguments
)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"]["t"]).apply(null,argument
s)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"]["u"]).apply(null,ar
guments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["v"]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["w"]).apply(null,argumen
ts)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["x"]).app
ly(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["y"]).a
pply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"]["z"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["A"]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module[
"asm"]["B"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["C"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modul
e["_Conv2DBackpropInput"]=Module["asm"]["D"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["E"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["F"]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=
Module["asm"]["G"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["H"]).a
pply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["I"]).apply(null,arguments)};var

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_DeepwiseConv2dNative=Module["_DeepwiseConv2dNative"]=function(){return(_DeepwiseConv2dNative=Module["_DeepwiseConv2dNative"]=Module["asm"]["J"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"]["N"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"]["Q"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"]["R"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"]["S"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["T"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["U"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["V"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["W"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["X"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["Y"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["Z"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["_"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]["$"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["aa"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["ba"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["ca"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["da"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["ea"]).apply(null,arguments)};var

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_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var

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_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)
};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).ap
ply(null,arguments);var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,argumen
ts);var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(nu
ll,arguments);var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_Squared
Difference"]=Module["asm"][["Ha"]]).apply(null,arguments);var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,argume
nts);var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["as
m"][["Ja"]]).apply(null,arguments);var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,argument
s);var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,argum
ents);var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,argumen
ts);var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["Na"]]).apply(null,argu
ments);var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["Oa"]]).apply(null,argumen
ts);var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["Pa"]]).apply(null,ar
guments);var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["
Qa"]]).apply(null,arguments);var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["R
a"]]).apply(null,arguments);var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][["Sa"]]).apply(null,arguments);var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(nu
ll,arguments);var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,argument
s);var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"][["Va"]]).apply(null,arguments);var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["Wa"]]).
apply(null,arguments);var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["Xa"]]).apply(null,arguments);var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ya"
]).apply(null,arguments);Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function

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doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("")},1);doRun()},1)}else{doRun()}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]!="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n};\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\n\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';\n\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\n\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *
util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values
as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n }\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return
this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset,
dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n
}\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false

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otherwise.\n * @param dataId\n * @param force Optional, remove the data regardless of refCount\n */\n
disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data =
this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n
}\n\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData =
this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n
const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision():
32 {\n return 32;\n }\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n
getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n\n
dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n\n memory() {\n return {unreliable:
false};\n }\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated
elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset
== null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id =
this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n\n typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const
{memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n
case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new
Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset,
size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n}\n\nfunction
createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n
// miniprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n }\n response.arrayBuffer().then(binary => {\n
WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n
});\n });\n });\n return {};;\n });\n\n /**\n * Returns the path of the WASM binary.\n */\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n
simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n
// If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return
wasmPath;\n }\n\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported &&
threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path =
'tfjs-backend-wasm-simd.wasm';\n }\n\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n }\n }\n\n return wasmModuleFolder + path;\n }\n\n /**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n */\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\nexport async function init(): Promise<{ wasm: BackendWasmModule}> {\n const
[simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n ]);\n\n return new Promise((resolve, reject) =>
{\n const factoryConfig: WasmFactoryConfig = {};\n\n /**\n * This function overrides the Emscripten
module locateFile utility.\n */\n * @param path The relative path to the file that needs to be loaded.\n * @param
prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n const response = wasmWorkerContents;\n const blob = new

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Blob([response], { type: 'application/javascript'});\n    return URL.createObjectURL(blob);\n  }\n\n  if
(path.endsWith('.wasm')) {\n    return getPathToWasmBinary(\n      simdSupported as boolean,
threadsSupported as boolean,\n      wasmPathPrefix != null ? wasmPathPrefix : prefix);\n  }\n  return prefix
+ path;\n  };\n\n  // Use the instantiateWasm override when system fetch is not available.\n  // Reference:\n  //
https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n  factoryConfig.instantiateWasm =\n  createInstantiateWasmFunc(getPathToWasmBinary(\n    simdSupported as boolean, threadsSupported as
boolean,\n    wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n      // Emscripten already called console.warn so no need to
double log.\n      return;\n    }\n    if (initAborted) {\n      // Emscripten calls `onAbort` twice, resulting in double
error\n      // messages.\n      return;\n    }\n    initAborted = true;\n    const rejectMsg =\n      'Make sure the
server can serve the `.wasm` file relative to the ' +\n      'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n  };\n\n  let wasm: Promise<BackendWasmModule>;\n  // If `wasmPath` has
been defined we must initialize the vanilla module.\n  if (threadsSupported && simdSupported && wasmPath ==
null) {\n    factoryConfig.mainScriptUrlOrBlob = new Blob([\n      [var WasmBackendModuleThreadedSimd =
`
+\n      wasmFactoryThreadedSimd.toString()],\n      { type: 'text/javascript'}];\n    wasm =
wasmFactoryThreadedSimd(factoryConfig);\n  } else {\n    // The wasmFactory works for both vanilla and SIMD
binaries.\n    wasm = wasmFactory(factoryConfig);\n  }\n\n  // The WASM module has been successfully
created by the factory.\n  // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n    init:
module.cwrap('init', null, []),\n    initWithThreadCount:\n      module.cwrap('init_with_threads_count', null,
['number']),\n    getThreadCount: module.cwrap('get_threads_count', 'number', []),\n    registerTensor:
module.cwrap(\n      'register_tensor', null, [\n        'number', // id\n        'number', // size\n
'number', // memoryOffset\n      ]),\n    disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n    dispose: module.cwrap('dispose', voidReturnType, []),\n  };\n\n    resolve({ wasm: module });\n
  });\n};\n\nfunction typedArrayFromBuffer(n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n  switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer);\n    case
'int32':\n      return new Int32Array(buffer);\n    case 'bool':\n      return new Uint8Array(buffer);\n    default:\n
throw new Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm',
'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\nfunction
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*\n * export function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n    ' ' will be removed in a future release.);\n  if
(initAborted) {\n    throw new Error(\n      'The WASM backend was already initialized. Make sure you call ' +\n
      '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n  }\n  wasmPath = path;\n  customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * ```js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
```\n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory

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where the WASM binaries are located.  
 \* Note that this prefix will be used to load each binary (vanilla,  
 \* SIMD-enabled, threading-enabled, etc.).  
 \* - (object) Mapping from names of WASM binaries to custom  
 \* full paths specifying the locations of those binaries. This is useful if  
 \* your WASM binaries are not all located  
 \* in the same directory, or if your  
 \* WASM binaries have been renamed.  
 \* @param usePlatformFetch optional  
 \* boolean to use platform fetch to download  
 \* the wasm file, default to false.  
 \* @doc {heading:  
 'Environment', namespace: 'wasm'}  
 ^\nexport function setWasmPaths(\n prefixOrFileMap: string|{\n key in  
 WasmBinaryName}?: string|,\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n  
 'The WASM backend was already initialized. Make sure you call ' +\n  
 `setWasmPaths()` before you call  
 `tf.setBackend()` or ' +\n  
 `tf.ready()`);\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix  
 = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n  
 wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new  
 Error(\n  
 `There were no entries found for the following binaries: ` +\n  
 `\${missingPaths.join(',')}. Please  
 either call setWasmPaths with a ` +\n  
 `map providing a path for each binary, or with a string indicating ` +\n  
 `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n }\n\n\*\*  
 Used in unit tests. ^\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n  
 wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n }\n\nlet threadsCount = -1;\nlet  
 actualThreadsCount = -1;\n\n\*\*  
 \* Sets the number of threads that will be used by XNNPACK to create  
 \* threadpool (default to the number of logical CPU cores).  
 \*  
 \* This must be called before calling  
 \* tf.setBackend('wasm')`.  
 ^\nexport function setThreadsCount(numThreads: number) {\n threadsCount =  
 numThreads;\n }\n\n\*\*  
 \* Gets the actual threads count that is used by XNNPACK.  
 \*  
 \* It is set after the  
 \* backend is initialized.  
 ^\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n  
 throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n }\n\n",  
 export const  
 wasmWorkerContents = 'var Module={};function threadPrintErr(){var  
 text=Array.prototype.slice.call(arguments).join(" ");console.error(text)}function threadAlert(){var  
 text=Array.prototype.slice.call(arguments).join(" "  
 `");postMessage({cmd:"alert",text:text,threadId:Module["\_pthread\_self"]()})}var  
 err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){var  
 instance=new  
 WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);  
 return instance.exports};function  
 moduleLoaded(){this.onmessage=function(e){try{if(e.data.cmd===`load`){Module["wasmModule"]=e.data.wasmModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;Module["ENVIRONMENT\_IS\_PTHREAD"]=true;if(typeof e.data.urlOrBlob===`string`){importScripts(e.data.urlOrBlob)}else{var objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else if(e.data.cmd===`objectTransfer`){Module["PThread"].receiveObjectTransfer(e.data)}else if(e.data.cmd===`run`){Module["\_\_performance\_now\_clock\_drift"]=performance.now()-e.data.time;Module["\_\_emscripten\_thread\_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["\_\_emscripten\_tls\_init"]();Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["\_pthread\_self"](),1);try{var result=Module["invokeEntryPoint"](e.data.start\_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module["PThread"].threadExit(result)}catch(ex){if(ex===`Canceled!`){Module["PThread"].threadCancel()}else if(ex!==`unwind`){if(ex instanceof Module["ExitStatus"]){if(Module["getNoExitRuntime"]()){}}else{Module["PThread"].threadExit(ex.status)}}else{Module["PThread"].threadExit(-2);throw ex}}}}else if(e.data.cmd===`cancel`){if(Module["\_pthread\_self"]()){Module["PThread"].threadCancel()}}else

```

if(e.data.target===\"setimmediate\")} else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()} } else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)} } catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex } };if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href: __filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){ onmessage({ data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){ parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"/** @license See the
LICENSE file. *^\\n\\n// This code is auto-generated, do not modify this file!\\nconst version = '3.11.0';\\nexport
{version};\\n\", \"/**\\n * @license\\n * Copyright 2020 Google LLC. All Rights Reserved.\\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\\n * See the License for the specific language governing permissions and\\n * limitations under the
License.\\n *
=====\\n
*^\\n\\nimport './flags_wasm';\\n\\nimport {registerBackend} from 'tensorflow/tfjs-core';\\n\\nimport {BackendWasm,
init} from './backend_wasm';\\n\\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\\n\\nexport {version as version_wasm} from './version';\\n\\nconst
WASM_PRIORITY = 2;\\nregisterBackend('wasm', async () => {\\n const {wasm} = await init();\\n return new
BackendWasm(wasm);\\n},
WASM_PRIORITY);\\n\"], \"names\": [\"CppType\", \"FusableActivation\", \"wasmFusedMatMul\", \"fusedMatMulConfig\",
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extDecoder","endPtr","decode","BackendWasm","KernelBackend","[object  
Object]","super","tfjs","initWithThreadsCount","threadsCount","actualThreadsCount","getThreadsCount","DataStor  
age","engine","dataIdNextNumber","move","numDataIds","kernelMs","refCount","memoryOffset","numBytes","by  
tesPerElement","registerTensor","byteOffset","typedArrayFromBuffer","force","has","delete","dispose","unreliable  
","write","getPathToWasmBinary","simdSupported","threadsSupported","wasmModuleFolder","wasmPath","wasm  
FileMap","init","all","getAsync","factoryConfig","endsWith","blob","Blob","URL","createObjectURL","wasmPath  
Prefix","customFetch","instantiateWasm","imports","arrayBuffer","createInstantiateWasmFunc","initialized","onAb  
ort","initAborted","mainScriptUrlOrBlob","wasmFactoryThreadedSimd","toString","wasmFactory","wasmBinaryN  
ames","setWasmPath","usePlatformFetch","deprecationWarn","setWasmPaths","prefixOrFileMap","missingPaths",  
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AU2B,EAAMtG,OAC/C,GAAwC,IAApCkC,EAACK,cAAcmE,EAAMxF,OAAc,CACzC,MAAMS,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GACChDid,GAAQtX,EAASxH,GAASmD,EAAEhC,OAAQ2G,EAAyPf,G AQID,GALluE,GAEFzG,EAAQuH,YAAYZ,EAAWvF,QAG7B2F,EAAU,CAEZ,MAAM3D,EAAWC,EAAamE,q BAAqBxF,EAAIP,MAAO0E,GAC9DnE,EAAIP,MAAQ2B,EAGd,OAAOpB,IC9DIyc,GACTxb,GAAYByb,IAFC, GCK9B,IAAKC,GAKL,IAAIC,IALJ,SAAKD,GACHA,yBACAA,6BAFF,CAAKA,KAAAA,QAkDE,MAAME,G AAgC,CAC3Cjf,WAAyKf,GACZhf,YAAa,OACbK,WA9BF,SAAmBC,GAKjB,MAAOC,QAAQsC,EAACA,GAA E3C,QAAEA,EAASM,OAAOye,SAACA,EAAQC,KAAEA,IAAS5e,EAEIDkF,EAAWyZ,EAAS3a,KACtB,CAAC 6a,EAAGpb,IAAMob,EAAE,GAAqBtc,EAAEIB,MAAMoC,GAAKob,EAAE,KAC9Crc,EAAM5C,EAAQkB,UA AUC,IAAIwB,EAAEvB,QAAQC,GACTcW,EAAMhC,EAAQiC,WAAWqD,EAAU3C,EAAEhC,OACrCuB,EAA QIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAC1CuE,EAAC,IAAIxD,WAAW,IAAIC,WAAWM,EAAEIB,O AAOa,QAERd4c,EAakBH,EAAS3a,KAAI+a,GAAYA,EAAS,KACpDC,EAAMbL,EAAS3a,KAAI+a,GAAYA,E AAS,KACrDE,EACF,IAAIjd,WAAW,IAAIC,WAAW6c,GAAiB5c,QAC7Cgd,EACF,IAAIld,WAAW,IAAIC,WA AW+c,GAakB9c,QAKpD,OAHAsc,GACIhc,EAakgD,EAAajD,EAAEIB,MAAMC,OAAQIC,GAASmD,EAAEh C,OAAQ0e,EACrDC,EAAMbX,GAakBK,GAAO9c,GACzCF,GAOPjC,UA5CF,SAAeC,GACb4e,GAAGb5e,EA AQc,KAAKC,MAAM4e,GAAW,KAAiB,CAC7D,SACA,QACA,SACA,SACA,QACA,QACA,SACA,aCrBSS,GA CTtc,GAAYBuc,IAFC,GCFjBC,GAA0Bjd,GAAwBkd,aCW/CC,GACZ3f,EAAsB4f,GACxB,MAAM5P,EAAS,IA AI3N,WAAWrC,EAAQC,KAAK4f,OAAOvd,OAAQsd,EAAW,GAC/DE,EAAMb9P,EAAO,GAC1B+P,EAAe/P, EAAO,GACTBgQ,EAakBhQ,EAAO,GACzBiQ,EAAGbjQ,EAAO,GAG7B,OADAhQ,EAAQC,KAAKigB,MAAM N,GACZ,CAACE,iBAAAA,EAakBC,aAAAA,EAACc,gBAAAA,EAaiBC,cAAAA,GChB3D,IAAIvd,GA6CG,M AAMyd,GAA0C,CACrDvgB,WAAywgB,GACZtgB,YAAa,OACbC,UA5CF,SAAeC,GACb0C,GAAW1C,EAAQ C,KAAKC,MACpBkgB,GACA,SACA,CACE,SACA,SACA,SACA,SACA,SACA,YAoCNjgB,WAhCF,SAAoBC,GAKIB, MAAMJ,QAACA,EAAOK,OAAEA,EAAMC,MAAEA,GAASF,GAC3BigB,aAACA,EAAYC,cAAEA,EAAaC,eA AEA,GAakBjgB,GAChDiV,MAACA,EAakIL,OAAEA,GAAUngB,EAEIB0V,EAAU/V,EAAQkB,UAAUC,IAA IoU,EAAMnU,QAAQC,GAC9Cof,EAAWzgB,EAAQkB,UAAUC,IAAIqf,EAAOpf,QAAQC,GAehDue,EACfld, GAASqT,EAAS0K,EAUAH,EAAeD,EAACe,IAEvDT,iBAACA,EAAGBC,aAAEA,EAAYC,gBAAEA,EAAeC,cA AEA,GACpDN,GAakB3f,EAAS4f,GAS/B,OANA5f,EAAQC,KAAKigB,MAAMF,GACnBhgB,EAAQC,KAAKig B,MAAMD,GAGfjgB,EAAQiC,WAAW,CAAC8d,GAAe,QAASD,KCxCID,IAAIpd,GakDG,MAAMge,GAAOC, CACrD9gB,WAAy+gB,GACZ7gB,YAAa,OACbC,UAhDF,SAAeC,GACb0C,GAAW1C,EAAQC,KAAKC,MAC pBygB,GACA,SACA,CACE,SACA,SACA,SACA,SACA,SACA,SACA,UAuCNxgB,WAnCF,SAA6BC,GAK3B,MAAMJ ,QAACA,EAAOK,OAAEA,EAAMC,MAAEA,GAASF,GAC3BigB,aAACA,EAAYC,cAAEA,EAAaC,eAAEA,EA AcK,mBAAEA,GACHdtgB,GACEiV,MAACA,EAakIL,OAAEA,GAAUngB,EAEIB0V,EAAU/V,EAAQkB,UAA UC,IAAIoU,EAAMnU,QAAQC,GAC9Cof,EAAWzgB,EAAQkB,UAAUC,IAAIqf,EAAOpf,QAAQC,GAehDue,E AAYld,GACdqT,EAAS0K,EAUAH,EAAeD,EAACe,EACHDK,IAEEed,iBAACA,EAAGBC,aAAEA,EAAYC,gBA AEA,EAAeC,cAAEA,GACpDN,GAakB3f,EAAS4f,GAU/B,OAPA5f,EAAQC,KAAKigB,MAAMF,GAOZ,CAJH hgB,EAAQiC,WAAW,CAAC8d,GAAe,QAASD,GAERb9f,EAAQiC,WAAW,GAAI,QAASge,MC7C7D,IAAIvd,G AkDG,MAAMme,GAA0C,CACrDjhB,WAAykhB,GACZhhB,YAAa,OACbC,UAhDF,SAAeC,GACb0C,GAAW1 C,EAAQC,KAAKC,MACpB4gB,GACA,SACA,CACE,SACA,SACA,SACA,SACA,SACA,SACA,YAuCN3gB,WAnCF,S AAoBC,GAKIB,MAAMJ,QAACA,EAAOK,OAAEA,EAAMC,MAAEA,GAASF,GAC3BigB,aAACA,EAAYC,cA AEA,EAAaC,eAAEA,EAACq,aAAEA,GAAGbzgB,GAC9DiV,MAACA,EAakIL,OAAEA,GAAUngB,EAEIB0V, EAAU/V,EAAQkB,UAAUC,IAAIoU,EAAMnU,QAAQC,GAC9Cof,EAAWzgB,EAAQkB,UAAUC,IAAIqf,EAA Opf,QAAQC,GAehDue,EAYld,GACdqT,EAAS0K,EAUAH,EAAeD,EAACe,EACHDQ,IAEEjB,iBAACA,EAAG BC,aAAEA,EAAYC,gBAAEA,EAAeC,cAAEA,GACpDN,GAakB3f,EAAS4f,GAW/B,OAPA5f,EAAQC,KAAKi gB,MAAMD,GAOZ,CAJHjgB,EAAQiC,WAAW,CAAC8d,GAAe,QAASD,GAES5C9f,EAAQiC,WAAW,CAAC8d ,GAAe,UAAWC,MChDvCgB,GACT/d,GAAYbge,IAFC,EAEgC,QCA9D,IAAIC,GA+BG,MAAMC,GAA6B,CAC xCvhB,WAAywhB,GACZthB,YAAa,OACbC,UA9BF,SAAeC,GACbkhB,GAAalhB,EAAQC,KAAKC,MAAMkh B,GAAQ,KAAiB,CACvD,SACA,SACA,SACA,SACA,YAyBFjhB,WArBF,SACIC,GACF,MAAMC,OACA,EA AML,QAAEA,EAAOM,MAAEA,GAASF,GAC3B2a,QAACA,GAAW1a,GACZghB,MAACA,EAACK,QAAEA, EAAOC,SAAEA,GAAYjhB,EAE7B0B,EAAMhC,EAAQiC,WAAW,IAAI8Y,EAAQtZ,MAAO4f,GAAQ,SACpDn

f,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAG1Cia,EADctb,EAAQkB,UAAUC,IAAI4Z,EAAQ3Z,QACpBC,GAI9B,OFA6f,GAAW5F,EAAW+F,EAAOC,EAASC,EAAUrf,GAeZCF,ICpBF,MAAMwf,GAA+B,CAC1C5hB,WAAy6hB,GACZ3hB,YAAa,OACbK,WAXF,SAAkBC,GACHB,MAAOC,QAAQsC,EAACA,GAAE3C,QAAEA,GAAWI,EACzB4B,EAAMhC,EAAQiC,WAAWU,EAAEIB,MAAOkB,EAAEhC,OAG1C,OAFgBX,EA AQwE,mBAAMbxC,GACnC0W,KAAK,GACN1W,ICmCF,MAAM0f,GAA2B,CACtC9hB,WAAy+hB,GACZ7h B,YAAa,OACbK,oBAxCEC,GAEF,MAAMC,OAACA,EAAML,QAAEA,EAAOM,MAAEA,GAASF,GAC3B4F, KAACA,GAAQ1F,EAef,GAAsB,IAAIBD,EAAOqB,OACT,OAAO0W,GACH,CAAC/X,OAAQ,CAAC4G,MAA O5G,EAAO,IAAKL,QAAAA,EAASM,MAAO,CAAC+X,IAAKrS,KAGzD,MAAMvE,EAAQpB,EAAO,GAAGo B,MACIBd,EAAQN,EAAO,GAAGM,MAExBN,EAAOgR,SAAQV,IACb9N,EAAK+e,kBACDngB,EAAOkP,EA AEIP,MACT,yDACJoB,EAAKoH,OACDj,IAAUgQ,EAAEhQ,OACZ,IAAM,6DAGZ,MAAMkhB,EAAwC,GAQ xC7R,EAAS7E,GAAO,CAAC9K,OAPCA,EAAO+D,KAAIuM,IACjC,MAAMmR,EACF1J,GAAW,CAAC/X,OA AQ,CAAC4G,MAAO0J,GAAI3Q,QAAAA,EAASM,MAAO,CAAC+X,IAAKrS,KAE1D,OADA6b,EAAwB5c,KA AK6c,GACtBA,KAGuC9hB,QAAAA,EAASM,MAAO,CAAC0F,KAAAA,KAIjE,OFA6b,EAAwBxQ,SAAQV, GAAK3Q,EAAQuH,YAAyOj,EAAEvP,UAEPd4O,ICjCT,IAAI+R,GAsDG,MAAMC,GAA4B,CACvCpiB,WAA YqiB,GACZniB,YAAa,OACbK,WAvCF,SACIC,GACF,MAAOC,QAAQsC,EAACA,GAAE3C,QAAEA,EAASM, OAAOye,SAACA,EAAQmD,cAAEA,IAAkB9hB,EAE3DkF,EAAWyz,EAA53a,KACtB,CAAC6a,EAAGpb,IAA Mob,EAAE,GAAqBtc,EAAEIB,MAAMoC,GAAKob,EAAE,KAEPd,GAAoC,IAAhCpc,EAAKC,cAAcH,EAAEIB ,OAGvB,OAAOix,GAAK,CACV1Y,QAAAA,EACAM,MAAO,CAACmB,MAAO6D,EAAUqT,MAAOuJ,EAAev hB,MAAOgC,EAAEhC,SAI5D,MAAMiC,EAAM5C,EAAQkB,UAAUC,IAAIwB,EAAEvB,QAAQC,GACtCW,E AAMhC,EAAQiC,WAAWqD,EAAU3C,EAAEhC,OAERcuB,EADgBIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QACp BC,GAETbuE,EAAC,IAAIxD,WAAW,IAAIC,WAAWM,EAAEIB,OAAOa,QAERd4c,EAakBH,EAAS3a,KAAI+a ,GAAYa,EAAS,KACpDC,EAAmBL,EAAS3a,KAAI+a,GAAYa,EAAS,KACrDE,EACF,IAAIjd,WAAW,IAAIC, WAAW6c,GAAiB5c,QAC7Cgd,EACF,IAAIld,WAAW,IAAIC,WAAW+c,GAakB9c,QAkPd,OAHAyf,GACInf,E AAKgD,EAAajD,EAAEIB,MAAMC,OAAQIC,GAASmD,EAAEhC,OAAQ0e,EACrDC,EAAmB4C,EAAehgB,G AC/BF,GAOPjC,UArDF,SAAeC,GACb+hB,GAAY/hB,EAAQC,KAAKC,MAAM+hB,GAAO,KAAiB,CACrD,SA CA,QACA,SACA,SACA,QACA,SACA,SACA,aCnBSE,GACTIf,GAAYBmf,IAFC,GCI9B,IAAIC,GAKCG,MAA MC,GAA4B,CACvC1iB,WAAy2iB,GACZziB,YAAa,OACbC,UAnCF,SAAeC,GACbqiB,GAAYriB,EAAQC,KA AKC,MAAMqiB,GAAO,KAAiB,CACrD,SACA,SACA,YAGCFpiB,WA5BF,SAAeC,GACb,MAAMC,OAACA,E AAML,QAAEA,GAAWI,GACpBuC,EAACA,EAACoa,MAAEA,GAAS1c,EACbuC,EAAM5C,EAAQkB,UAAU C,IAAIwB,EAAEvB,QAAQC,GACtCmhB,EAAyxiB,EAAQkB,UAAUC,IAAI4b,EAAM3b,QAAQC,GAETd,IAA I2F,EAAUpE,EACd,MAAMqE,EAAQtE,EACd,IAAI0b,EAACPX,EACE,YAAhBA,EAAMtG,QACR0d,EAAcpO, GAAK,CAACjQ,QAAAA,EAASK,OAAQ,CAACsC,EAAAA,GAAIrC,MAAO,CAACK,MAAO,aACzDqG,EAA UhH,EAAQkB,UAAUC,IAAIkd,EAAyjd,QAAQC,IAGtD,MAAMW,EAAMhC,EAAQiC,WAAWU,EAAEIB,MA AO,WACICS,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,QAAQC,GAMhD,OALghB,GAAUrb,EAASwb,EAA WtgB,GAEV,YAAhB+E,EAAMtG,OACRX,EAAQuH,YAAy8W,EAAyjd,QAE3BY,IC7BT,IAAIygB,GAmEG, MAAMC,GAA2B,CACtC9iB,WAAy+iB,GACZ7iB,YAAa,OACbC,UAIEF,SAAeC,GACbyiB,GAAWziB,EAAQ C,KAAKC,MAAMyiB,GAAM,KAAe,CACjD,SACA,SACA,SACA,YA8DFxiB,WA1DF,SAAcC,GAKZ,MAAMJ, QAACA,EAAOK,OAAEA,EAAMC,MAAEA,GAASF,GAC3B4F,KAAKA,EAAlE,SAAEA,GAAYzG,GACnBqC, EAACA,GAAKtC,EACNuC,EAAM5C,EAAQkB,UAAUC,IAAIwB,EAAEvB,QAAQC,GAC5C,IAAI2F,EAAUpE ,EACVqE,EAAQtE,EAEZ,MAAMgE,WAACA,EAAUN,KAAEA,EAAIF,aAAEA,EAAyM,mBAAEA,GACnCV, GAAwBpD,EAAGqD,EAAMhG,GAERc,IAAIoe,EAAGb/X,EACpB,GAII,EAAoB,CACtB,MAAMqB,EAAe9H, EAAQkB,UAAUC,IAAIwF,EAAWvF,QAAQC,GAC1DyG,IAAIbIF,IAGnBqE,EAAQN,EACRK,EAAUc,EACVs W,EAAGb/a,EAaqD,iBACzB0X,EAAC1c,OAAQuF,EAAMxF,MAAMC,SAI1C2B,EAAa8D,2BACT,OAAQiX, EAAenX,EAAMxF,MAAMC,QACvC,MAAO4D,EAAU8B,GACb/D,EAAagE,0BAA0BJ,EAAMxF,MAAO2c,GA CID9W,EAAazE,EAAKC,cAAcS,E,GAehCpF,EAAMhC,EAAQiC,WAAWqD,EAAU2B,EAAMtG,OAC/C,GAAW C,IAApCkC,EAAKC,cAAcmE,EAAMxF,OAAC,CACzC,MAAMS,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAIZ,Q AAQC,GACHDohB,GAASzb,EAASM,EAAY9H,GAASwC,EAAIrB,OAAQuB,GAQRd,GALiUE,GAEFzG,EAAQ uH,YAAyZ,EAAWvF,QAG7B2F,EAAU,CAEZ,MAAM3D,EAAWC,EAAAmE,qBAAqBxF,EAAIP,MAAO0E,G

AC9DnE,EAAIP,MAAQ2B,EAGd,OAAOpB,ICvDI4gB,GAA4B,CACvChjB,WAA YijB,GACZ/iB,YAAa,OACbK ,WAdGC,IACC,MAAMJ,QAACA,EAAOM,MAAEA,GAASF,GACnB0iB,MAACA,EAAKC,KAAEA,EAAIC,K AAEA,EAAIriB,MAAEA,GAASL,EAC7B0M,ECTL,SAAmB8V,EAAOC,EAAMC,EAAmriB,GAIzC,GAHsBmi B,IAAUC,GACID,EAAQC,GAAQC,EAAO,GACvBD,EAAOD,GAASE,EAAO,EAGvD,OAAOngB,EAAKogB,o BAAoB,EAAGtiB,GAEvC,MAAMuiB,EAaczX,KAAK0X,IAAI1X,KAAK2X,MAAML,EAAOD,GAASE,IACID hW,EASnK,EAAKogB,oBAAoBC,EAAaviB,GACjDoiB,EAAOD,GAakB,IAATE,IAGhBA,GAAQ,GAEZhw,E AAO,GAak8V,EACZ,IAAK,IAAIjf,EAAI,EAAGA,EAAImJ,EAAOtL,OAAQmC,IAC/BmJ,EAAOnJ,GAakmJ, EAAOnJ,EAAI,GAakmf,EAehC,OAAOhW,EDVUqW,CAaAp,EAAOC,EAAMC,EAAmriB,GAezCqB,EAAMh C,EAAQiC,WAAW,CAAC+K,EAAOtL,QAASf,GAGhD,OFgBX,EAAQwE,mBAAmBxC,GACnCyC,IAAIuI,G ACLhL,IETashB,GACTrgB,GAAYBsgB,IAFC,GCFjBC,GAA2BhhB,GAawBihB,ICAnDC,GAA4BlhB,GAawB mhB,ICiJE,IAAIC,GA4DG,MAAMC,GAAqC,CAChDjkB,WAA YkkB,GACZhkB,YAAa,OACbC,UA1DF,SAAeC ,GACb4jB,GAAqB5jB,EAAQC,KAAKC,MAAM4jB,GAAGb,KAAe,CACrE,SACA,SACA,SACA,SACA,SACA, SACA,SACA,SACA,SACA,YA gDF3jB,WA5CF,SAAwBC,GAKtB,MAAMJ,QAACA,EAAOK,OAAEA,EAAMC ,MAAEA,GAASF,GAEB2jB,OAACA,GAAU1jB,GACX2jB,aACA,EAAYC,iBAAEA,EAAGbnY,KAAEA,GA AQxL,GACx4jB,EAAWC,GAAYrY,GAEvBoN,EAAOkL,EAAWC,EAAUhL,GAae0K,EAAOtIb,MACnD6D,E AAW,CAAC4T,EAAOgL,EAAWC,EAU9K,GAe9C,IACIzD,EADA0O,EAAQtKb,EAAQkB,UAAUC,IAAI4iB, EAAO3iB,QAerB,YAAhBkjB,EAAM3jB,QACriV,EACI3F,GAak,CAACjQ,QAAAA,EAASK,OAAQ,CAACsC ,EAAGohB,GAASzjB,MAAO,CAACK,MAAO,aACvD2jB,EAAQtKb,EAAQkB,UAAUC,IAAIyU,EAAWxU,SA E3C,MAAMwB,EAAM0hB,EAAMjjB,GAEZw,EAAMhC,EAAQiC,WAAWqD,EAAU,WACzC,GAAYC,IAArCz C,EAAKC,cAAcihB,EAAOtIb,OAC5B,OAAOO,EAET,MAAME,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAlZ,QA AQc,GAUhD,ORAUiB,GACIhhB,EAAKsW,EAAOkL,EAAWC,EAAUhL,EAAa6K,EAAWC,EACzDH,EAAe, EAAI,EAAGC,EAAMb,EAAI,EAAG/hB,GAEIC,MAAd0T,GACF5V,EAAQuH,YAA YqO,EAAWxU,QAG1BY,I CxDT,IAAIuiB,GA6CG,MAAMC,GAA8B,CACzC5kB,WAA Y6kB,GACZ3kB,YAAa,OACbK,oBAhCEC,GAEF, MAAMC,OAACA,EAAML,QAAEA,EAAOM,MAAEA,GAASF,GAC3BuC,EAACA,GAAKtC,GACNqkB,KAA CA,GAAQpkB,EAET+F,EAAOxD,EAAKuD,eAAese,EAAM/hB,EAAEIB,OAEzC,GAauB,IAAnBkB,EAAEIB, MAAMC,OACV,OAAO4C,GAAS,CAACjE,OAAQ,CAACsC,EAAAA,GAAl3C,QAAAA,IAGhC,MAAMgC,EA AMhC,EAAQiC,WAAWU,EAAEIB,MAAOkB,EAAehC,OACpCiC,EAAM5C,EAAQkB,UAAUC,IAAIwB,EAA EvB,QAAQC,GACtCa,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAlZ,QAAQC,GAElCsJb,EAAY,IAAIvIB,WAAW, IAAIC,WAAWgE,GAAM/D,QACHdsiB,EAAGb,IAAIxiB,WAAW,IAAIC,WAAWM,EAAEIB,OAAOa,QAe7Dii B,GACI3hB,EAAK+hB,EAAWte,EAAK3E,OAAQkjB,EAaejiB,EAAEIB,MAAMC,OAAQQ,GAehE,MAAMmN ,EACFxF,GAAQ,CAACxJ,OAAQ,CAACsC,EAAGX,GAAM1B,MAAO,CAACmB,MAAOkB,EAAEIB,OAAQzB ,QAAAA,IAGxD,OADAA,EAAQuH,YAA YvF,EAAlZ,QACjBiO,GAOPtP,UA7CF,SAAeC,GACbukB,GAacvkB ,EAAQC,KAAKC,MAAMukB,GAAS,KAAM,CAC9C,SACA,QACA,SACA,QACA,SACA,aCbJ,IAAII,GAqDG, MAAMC,GAauC,CACIDIb,WAA YmlB,GACZjIB,YAAa,OACbK,oBAnC+BC,GAK/B,MAAMC,OAACA,EA ML,QAAEA,EAAOM,MAAEA,GAASF,GAC3BkV,MAACA,GAASjV,GACV2kB,QAACA,EAAOC,UAAEA,E AASC,OAAEA,GAU5kB,EAE/B0B,EAAMhC,EAAQiC,WAAWqT,EAAM7T,MAAO6T,EAAM3U,OAC5CsY, EAAUjZ,EAAQkB,UAAUC,IAAIuI,EAAMIU,QAAQC,GAC9Ca,EAAQIC,EAAQkB,UAAUC,IAAIa,EAAlZ,Q AAQC,IAEzC6X,EAAOC,EAAaC,EAAYC,GAae/D,EAAM7T,OAerD0jB,EAASC,GACZ/hB,EAAgiB,eAAeH, EAAQ/L,EAAaC,GAK/CkM,EAAkC,iBAAdL,EACtB,CAACA,EAawa,EAawa,EAJO,IAAdA,EAIGc,EAH3B, KAIRb,IAAIA,EAJiB,KAKnBM,EAAY,IAAIjB,WAAW,IAAIC,WAAWijB,GAAYhjB,QAK5D,OHAuiB,GAC I5L,EAASC,EAAOC,EAAaC,EAAYC,EAa2L,EAASG,EAC/DC,EAASG,EAawD,EAaw5jB,OAAQQ,GACpC F,GAOPjC,UApDF,SAAeC,GACb6kB,GAaa7kB,EAAQC,KAAKC,MAAM6kB,GAakB,KAAiB,CACjE,SACA, SACA,SACA,SACA,SACA,SACA,SACA,SACA,QACA,SACA,aCnBSS,GAA4BhjB,GAawBijB,ICDpDC,GAA4 BljB,GAawBmjB,ICiJE,IAAIC,GAmDG,MAAMC,GAAgC,CAC3CjmB,WAA YkmB,GACZhmB,YAAa,OACbC, UAjDF,SAAeC,GACb4IB,GAAGb5IB,EAAQC,KAAKC,MAAM4IB,GAaw,KAAe,CAC3D,SACA,SACA,SACA ,SACA,SACA,SACA,QACA,SACA,YAwCF3IB,WApCF,SACIC,GAGF,MAAMJ,QAACA,EAAOK,OAAEA,EA AMC,MAAEA,GAASF,GAC3B2a,QAACA,EAAOgL,QAAEA,GAaw1IB,GACrBoB,MAACA,GAASnB,EAEOV B,EAAMhC,EAAQiC,WAAWR,EAAOsKb,EAAQplB,OAC9C,GAakC,IAA9BkC,EAAKC,cAAcrB,GACrB,OA

AOO,EAGT,MAAMqZ,UAACA,EAAS2K,WAAEA,EAAUnW,UAAEA,EAASvH,QAAEA,EAAO2d,WAAEA,G  
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AAYG, MAAM, GAAGnM, GAAwBgW, MAAiBiB, EAAMe, OAA3DzT, EAAI, WAAWYt, EAAO, qCAA4CjL, GAA  
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=====\\n

```
*/\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmAvgPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n}\n\nfunction
avgPool(\n args: { inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs }) {\n const { inputs, attrs,
backend } = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const
{ filterSize, strides, pad, dimRoundingMode } = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const
channels = convInfo.inChannels;\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend
only supports average pooling with dilation = [1, 1], ` +\n `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc;\n};
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/AvgPool.js.map
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"sourcesConte
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=====
*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,

```



```

TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize:
number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array',
// xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', //
outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x,
indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index
= indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const
indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/GatherV2.js.map

```

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```

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```

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```

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* =====
*/
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `.wasm` file which will be fetched when the wasm
* backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
* for more details.
* @param path wasm file path or url
* @param usePlatformFetch optional boolean to use platform fetch to download
* the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.fesm.js

```

No license file was found, but licenses were detected in source scan.

```

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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n
*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds:
Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:

```

```
BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AddN.js.map
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No license file was found, but licenses were detected in source scan.

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=====\n *\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"]}]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Maximum.js.map
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No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\nlet wasmTopK:\n (xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: CppDType, k: number, sorted: boolean, outValuesId: number, outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n\n export const topk:\n (args: { inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs }) =>\n TensorInfo[] | TensorInfo = ({ inputs, backend, attrs }) => {\n const { x } = inputs;\n const { k, sorted } = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted, outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n };\n\n export const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as { } as KernelFunc,\n };"}\n\n
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/TopK.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n\n function oneHot(\n args: { inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm }) {\n const { inputs, backend, attrs } = args;\n const { indices } = inputs;\n const { depth, onValue, offValue } = attrs;\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n }\n\n export const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as KernelFunc,\n };}\n\n}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/OneHot.js.map

No license file was found, but licenses were detected in source scan.

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C;CAC/C,CAAC", "sourcesContent": ["/\*\n \* @license\n \* Copyright 2021 Google LLC. All Rights Reserved.\n \*  
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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
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=====\n

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { padV2Config } from
 './PadV2';\n\nimport { reshape } from './Reshape';\n\nimport { transpose } from './Transpose';\n\nfunction
spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs:
SpaceToBatchNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockSize,
padding } = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<number,
number> = [[0, 0]];\n completePaddings.push(...(padding as Array<number, number>));\n\n for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const paddedX =
padV2Config.kernelFunc({\n inputs: { x },\n backend,\n attrs: { padding: completePaddings, constantValue:
0 }\n}) as TensorInfo;\n\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs:
ReshapeInputs = { x: paddedX };\n const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n const
paddedXReshaped =\n reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n\n const transposeInputs:
TransposeInputs = { x: paddedXReshaped };\n const transposeAttrs:\n TransposeAttrs = { perm:
permutedReshapedPaddedPermutation };\n const paddedXT =\n transpose({ inputs: transposeInputs, backend,
attrs: transposeAttrs });\n\n const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n const
resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n const result = reshape(\n { inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SpaceToBatchND.js.map

No license file was found, but licenses were detected in source scan.

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BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the  
License for the specific language governing permissions and\n \* limitations under the License.\n \*  
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```
*\nimport { KernelConfig, NotEqual } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from
 './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n"]}
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Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-  
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No license file was found, but licenses were detected in source scan.

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```



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```
=====
*\n\nimport { KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,
util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { cast } from
'./Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear =
backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', //
oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', //
newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n\n function
resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n }):
TensorInfo {\n const { backend, inputs, attrs } = args;\n\n const { images } = inputs;\n const { alignCorners,
halfPixelCenters, size } = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth,
numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData =
backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({ backend, inputs: { x: images }, attrs: { dtype: 'float32' }});\n xData =
backend.dataIdMap.get(castedData.dataId);\n }\n\n const xId = xData.id;\n\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight,
oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if
(castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n }\n\n export const
resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n };
}
}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.js.map

No license file was found, but licenses were detected in source scan.

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```

=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //
padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number',
// inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnpack which only\n // supports float32.\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n

```

```
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MaxPool.js.map

No license file was found, but licenses were detected in source scan.

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http://www.apache.org/licenses/LICENSE-2.0\n *
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport { KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util } from '@tensorflow/tfjs-
core';\nimport { BackendWasm } from '../backend_wasm';\nexport function reshape(\n args: { inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm }) {\n const { inputs, attrs } = args;\n const { x } =
inputs;\n const { shape } = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>
`new shape: ${ $shape }, old shape: ${ x.shape }. New shape and old ` +\n `shape must have the same number of
elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return { dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as { } as KernelFunc\n};\n"]}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reshape.js.map

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agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \*  
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for  
the specific language governing permissions and\n \* limitations under the License.\n \*  
=====\n \*\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,  
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend\_util} from '@tensorflow/tfjs-core';\nimport  
{BackendWasm} from './backend\_wasm';\nlet wasmRotate: (\n xId: number, batch: number, imageHeight:  
number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /\* void \*/, [\n 'number', // xId\n 'number', //  
batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', //  
radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n ]);\n export function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n }): TensorInfo {\n const {inputs, backend, attrs} =  
args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n const out =  
backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const [batch, imageHeight, imageWidth, numChannels] =  
image.shape;\n const [centerX, centerY] =\n backend\_util.getImageCenter(center, imageHeight,  
imageWidth);\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n const fillValues =  
typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY,  
fillBytes, fillValues.length, outId);\n return out;\n }\n export const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n };}\n}

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RotateWithOffset.js.map

No license file was found, but licenses were detected in source scan.

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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
\n
*\n\nimport { backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { cast } from './Cast';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
```

```

backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs});\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed
tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n }\n\n export const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {\n
as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Mean.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"tf-backend-
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../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_uti
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wasm.js", "../src/backend\_wasm.ts", "../src/version.ts", "../src/base.ts"], "sourcesContent": ["/\*\*\n \* @license\n \*  
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BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for  
the specific language governing permissions and\n \* limitations under the License.\n \*  
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\n \*  
\*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable\_activations.h.\nexport  
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu  
= 6\n}\n", /\*\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache  
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BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the  
License for the specific language governing permissions and\n \* limitations under the License.\n \*  
=====

\n \*  
\*\n\nimport { \_FusedMatMul, \_FusedMatMulAttrs, \_FusedMatMulInputs, KernelConfig, KernelFunc } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend\_wasm';\nimport { FusableActivation } from  
'./types';\n\nlet wasmFusedMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, activation: number,  
biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(\_FusedMatMul,  
null /\* void \*/, [\n 'number', // a\_id\n 'array', // a\_shape\n 'number', // a\_shape.length\n 'number', // b\_id\n 'array', // b\_shape\n 'number', // b\_shape.length\n 'number', // transpose\_a\n 'number', // transpose\_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', //  
leakyreluAlpha\n 'number' // out\_id\n ]);\n\nfunction fusedBatchMatMul(args: {\n inputs:  
\_FusedMatMulInputs,\n backend: BackendWasm,\n attrs: \_FusedMatMulAttrs\n}) {\n const { inputs, backend,  
attrs } = args;\n const { a, b, bias, preluActivationWeights } = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !==  
'float32') {\n throw new Error(\n `\_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n const aId =  
backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if  
(bias !== null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `\_FusedMatMul only supports rank-1 bias but got ` +\n rank  
\${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n const preluActivationWeightsId =  
preluActivationWeights == null ?\n 0 :  
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const  
fusedActivation =\n FusableActivation[activation as { } as keyof typeof FusableActivation];\n if  
(fusedActivation == null) {\n throw new Error(\n `\${activation} activation not yet supported for

```

FusedConv2D `+\n `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out =\n backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new\n Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n transposeA,\n transposeB, fusedActivation, biasId, preluActivationWeightsId,\n leakyreluAlpha || 0, outId);\n\n return\n out;\n}\n\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName:\n 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as { } as KernelFunc\n};\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\nimport\n {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nexport function\n createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId:\n number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs});\n\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const\n out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',\n setupFunc, kernelFunc};\n}\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n '../unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n *\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\n\nexport\n function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:\n DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n

```





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```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as\n KernelFunc,\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from\n './Identity';\n\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,\n xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs,\n backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better\n // due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,\n attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const\n cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out =\n backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId,\n xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return\n out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new\n Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]]\n {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if\n (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n \n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j =\n 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i &&\n (minValIdx === -1 || newPerm[minValIdx] >\n newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape,\n newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName:
```

'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n", "/\*\n \* @license\n \* Copyright 2020 Google Inc. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n x: TensorInfo,\n axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n/**\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, [number, number, number]);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n\n/**\n * Copyright 2021 Google LLC. All Rights
```

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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,
 null /*void*/, [number, number, number]);\n}\n\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,
 attrs: AnyAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis,
 backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
 util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
 backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
 out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:
 setup,\n kernelFunc: any as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-
core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from
'./kernel_utils';\nimport { CppDType } from './types';\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:
 number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n}\n\nfunction argmax(\n args:
 { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n const { backend, inputs, attrs } = args;\n const { axis } = attrs as {} as ArgMaxAttrs;\n const { x } = inputs as {} as ArgMaxInputs;\n const xId =
 backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes,
 inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose
 was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
 transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =
 backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =
 util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,
```

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CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the
transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const
argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as { }
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmAvgPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n
'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n
'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n}\n\nfunction
avgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,
backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat: ` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend
only supports average pooling with dilation = [1, 1], ` +\n ` got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n", "/*\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =
inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>

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`new shape: ${$shape}, old shape: ${x.shape}. New shape and old `+`n `shape must have the same number of
elements.`);`n`n // Backend needs to track refCount for the dataId for reshape op`n args.backend.incref(x.dataId);`n
return {dataId: x.dataId, shape: $shape, dtype: x.dtype};`n`n`nexport const reshapeConfig: KernelConfig = {`n
kernelName: Reshape,`n backendName: 'wasm',`n kernelFunc: reshape as {} as KernelFunc`n};`n"/**`n *
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the specific language governing permissions and`n * limitations under the License.`n *

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=====`n
*`n`nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';`n`nimport {BackendWasm} from './backend_wasm';`n`nimport {reshape} from
'./Reshape';`n`nlet wasmBatchMatMul: (`n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,`n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean,`n transposeB: boolean, outId: number) =>
void;`n`nfunction setup(backend: BackendWasm) {`n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [`n 'number', // a_id`n 'array', // a_shape`n 'number', // a_shape.length`n 'number', // b_id`n
'array', // b_shape`n 'number', // b_shape.length`n 'number', // transpose_a`n 'number', // transpose_b`n
'number' // out_id`n `]);`n`nfunction batchMatMul(args: {`n inputs: BatchMatMulInputs,`n backend:
BackendWasm,`n attrs: BatchMatMulAttrs`n}) {`n const {inputs, backend, attrs} = args;`n const {a, b} = inputs;`n
const {transposeA, transposeB} = attrs;`n`n if (a.dtype !== 'float32' || b.dtype !== 'float32') {`n throw new Error(`n
`BatchMatMul for non non-float32 tensors not yet supported.`);`n `}`n`n const aRank = a.shape.length;`n const
bRank = b.shape.length;`n`n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];`n const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];`n`n const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2];`n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1];`n`n const outerDimsA = a.shape.slice(0, -2);`n const outerDimsB = b.shape.slice(0, -2);`n`n const batchDimA =
util.sizeFromShape(outerDimsA);`n const batchDimB = util.sizeFromShape(outerDimsB);`n`n const
batchDimsCompatible =`n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;`n`n
util.assert(`n aRank >= 2 && bRank >= 2 && batchDimsCompatible,`n () => `Error in matMul: the input
batch dimensions must either be the `+`n `same or at least one input batch dimension must be 1. Got input `
+`n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);`n`n const outShapeOuterDims =`n
batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);`n const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);`n`n util.assert(`n innerShapeA === innerShapeB,`n
() => `Error in matMul: inner shapes (${innerShapeA}) and (`+`n ``${innerShapeB}) of Tensors with shapes
${a.shape} and `+`n ``${b.shape} and transposeA=${transposeA}`+`n ` and transposeB=${transposeB}
must match.`);`n`n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :`n
[batchDimA, outerShapeA, innerShapeA];`n const b3dShape = transposeB ? [batchDimB, outerShapeB,
innerShapeB] :`n [batchDimB, innerShapeB, outerShapeB];`n`n // The rest of the
implementation is designed to operate on rank-3 tensors`n const a3d = reshape({inputs: {x: a}, backend, attrs:
{shape: a3dShape}});`n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});`n`n const a3dId
= backend.dataIdMap.get(a3d.dataId).id;`n const b3dId = backend.dataIdMap.get(b3d.dataId).id;`n`n const leftDim
= transposeA ? a3d.shape[2] : a3d.shape[1];`n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];`n const
batchDim = Math.max(batchDimA, batchDimB);`n`n const out = backend.makeOutput([batchDim, leftDim,
rightDim], a3d.dtype);`n const outId = backend.dataIdMap.get(out.dataId).id;`n`n const aShapeBytes = new
Uint8Array(new Int32Array(a3d.shape).buffer);`n const bShapeBytes = new Uint8Array(new
Int32Array(b3d.shape).buffer);`n`n wasmBatchMatMul(`n a3dId, aShapeBytes, a3d.shape.length, b3dId,
bShapeBytes,`n b3d.shape.length, transposeA, transposeB, outId);`n`n backend.disposeData(a3d.dataId);`n
backend.disposeData(b3d.dataId);`n`n out.shape = outShape;`n return out;`n`n`nexport const batchMatMulConfig:

```









```

*\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport { assertNotComplex
} from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n const isContinous =
slice_util.isSliceContinous(shape, begin, size);\n const length = util.sizeFromShape(size);\n const xStrides =
util.computeStrides(shape);\n if (isContinous) {\n const flatOffset = slice_util.computeFlatOffset(begin,
xStrides);\n if (dtype === 'string') {\n return vals.slice(flatOffset, flatOffset + length);\n }\n }\n return vals.subarray(flatOffset, flatOffset + length);\n}\n const decodedData = dtype === 'string' ?\nbackend_util.fromUint8ToStringArray(vals) :\n vals;\n const inBuf = buffer(shape, dtype, decodedData);\n const outBuf = buffer(size, dtype);\n for (let i = 0; i < outBuf.size; ++i) {\n const outLoc =
outBuf.indexToLoc(i);\n const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n if (dtype === 'string') {\n return
backend_util.fromStringArrayToUint8(outBuf.values);\n }\n return outBuf.values;\n}\nexport function
slice(args) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { begin, size } = attrs;\n assertNotComplex(x, 'slice');\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n const vals = backend.data.get(x.dataId).values;\n const outVals
= sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype,
outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc:
slice\n};\n/#

```

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sourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxlljoiU2xpY2UuanMiLCJzb3VyY2
VSb290IjoiIiwic291cmNleyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLVJhY2t1bmQtY3B1L3NyYy9rZXJhZGRlc3Zl
1NsaWNILnRzII0sIm5hbWVzIjpbXSswibWfWfcGluZ3MiOiJBQVFBOzs7Ozs7Ozs7Ozs7R0FIRzdBQVILE9
BQU8sRUFBRyxZQUFZLEVBBQWICLE1BQU0sRUFBC0MsS0FBSyxFUUFLFVBQVUsRUFBBUQsSUFBSSx
FQUFDLE1BQU0sdUJBRQVXVCLENBQUM7QUFHeEwsT0FBTyxFQUFDLGDcQUFNQixFQUFDLE1BQU0sYU
FBYSxDQUFDO0FBRTdDLE1BQU0sVUFBSXsTQUFTLENBQ3JCLEIBQW1CLEVBQUUsS0FBZSxFQUUFL
EIBQWMsRUFBRsXLQUFILEVBQ3JFLEtBQWU7SUFDAKIsTUFBTSxXQUFXLEDQUcsVUFBSXsDQUFDL
GDcQUFNQixDQUFDLEtBQUssRUFBRsXLQUFLLEVBQUUsSUFBSSxDQUFDLENBQUM7SUFDCeUsTUFB
TSxNQUNLEdBQucsSUFBSSxDQUFDLGFBBQWESQ0FBQyxJQUFJLENBQUMsQ0FBQztJQU4QYxNQUF
NLFFBQVESR0FBRyxJQUFJLENBQUMsY0FBYyxDQUFDLEtBQUssQ0FBQyxDQUFDO0IBRTVDLEIBQUks
V0FBVyxFUUFO1FBQ2YsTUFBTSxVQUFVLEDQUcsVUFBSXsDQUFDLGCQUFPQixDQUFDLEtBQUss
RUFBRsXRQUFRLENBQUMsQ0FBQztRQUVqRSxJQUFJLEtBQUssS0FBSyxRQUFRLEVBQUU7WUFDDIEs
T0FBUSxJQUFQixDQUFDLEtBQUssQ0FBQyxVQUFVLEVBQUUsVUFBSxHQUFHLE1BQU0sQ0FBQyxD
QUFD01NBQ3RFO1FBRUQsT0FBUSxJQUFQixDQUFDLFFBQVESQ0FBQyxVQUFVLEVBQUUsVUFBSX
HQUFHLE1BQU0sQ0FBQyxDQUFD0tBQ3ZFO0IBRUQsTUFBTSxXQUFXLEDQUcsS0FBSyxLQUFLFFB
QVESQ0FBQyxDQUFD01FBQ3BDLFIBQVksQ0FBQyxzQkFBc0IsQ0FBQyxJQUFVQixDQUFDLENBQUMsQ
0FBQztRQUMzRCxJQUFRQixDQUFD00IBRXZCLE1BQU0sS0FBSyxHQUFHLE1BQU0sQ0FBQyxLQUFLLE
VBQUUsS0FBSyxFUUFLFdBQVcsQ0FBQyxDQUFD00IBQ2heLE1BQU0sTUFBTSxHQUFHLE1BQU0sQ0F
BQyxJQUFJLEVBQUUsS0FBSyxDQUFDLENBQUM7SUFDBkMsS0FBSyxJQUFJLENBQUMsR0FBRyxDQUF
DLEVBQUUsQ0FBQyxHQUFHLE1BQU0sQ0FBQyxJQUFJLEVBQUUsRUFBRsxDQUFDLEVBQUU7UUFDC
EMsTUFBTSxNQUNLEDQUcsTUFBTSxDQUFDLFBQVUsQ0FBQyxDQUFDLENBQUMsQ0FBQztRQUN
wYyxNQUNLEDQUssR0FBRyxNQUNLENBQUMsR0FBRyxDQUFDLENBQUMsR0FBVyxFQUFFLENBQ
UMsRUFBRsxFQUFFLENBQUMsR0FBRyxHQUFHLEtBQUssQ0FBQyxDQUFDLENBQUMsQ0FBQyxDQUF
DO1FBQzdELE1BQU0sQ0FBQyxHQUFHLENBQUMsS0FBSyxDQUFDLEDQUcsQ0FBQyxHQUFHLEtBQUss
Q0FBQyxFUUFLLEDQUcsTUFBTSxDQUFDLENBQUM7S0FDNUM7SUFFRCxJQUFJLEtBQUssS0FBSyxR
QUFRLEVBQUU7UUFDDIEsT0FBTyxZQUFZLENBQUMsc0JBQXNCLLENBQUMsTUFBTSxDQUFDLE1BQ
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sQ0FBQztBQUVELE1BQU0sVUFBSXsLQUFLLENBQ2pCLEIBQXVFO0IBRXpFLE1BQU0sRUFBRyxNQUF
NLEVBQUUsT0FBTyxFQUFFLEtBQUssRUFBRyxHQUFHLEIBQUksQ0FBQztJQU4QYxNQUNLENBQUM
sQ0FBQyxFUUFDLEDQUcsTUFBTSxDQUFD00IBQ25CLE1BQU0sRUFBRyxLQUFLLEVBQUUsSUFBSSx
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UMsQ0FBQztJQUU3QixNQUFNLENBQUMsTUFBTSxQUUFFLEtBQUssQ0FBQyxHQUFHLFVBQVUsQ0FB  
QyxnQkFBZ0IsQ0FBQyxDQUFDLEVBQUUsS0FBSyxQUUFFLEtBQUksQ0FBQyxDQUFDO0IBQ3BFLFVBQ  
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XJuIG91dEJ1Zi52YWxz1ZXMgYXMGVHlwZWRBcnJheTtcbn1cbiAgZXhwb3J0IGZ1bmN0aW9uIHNsaWNlKFxu  
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wgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBjb25zdCB7YmVnaW4sIHNpemV9ID0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcb1xuICBjb25zdCB7JGJIZ2luLCAkc2l6ZV0gPSBzbGljZV91dGlsLnBhcniU2xpY2VQYXJhbXMOeCwgYmVnaW4sIHNpemUpO1xuICBzbGljZV91dGlsLmFzc2VydFBhcmFtc1ZhbGllKHGsICRiZWdpbiwgJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYWNRZW5kLmRhdGEuZ2V0KHguZGF0YUlkKS52YWx1ZXM7XG4gIGNvbnN0IG91dFZhbHMgPSBzbGljZUltcGwodmFscywJGJIZ2luLCAkc2l6ZSweC5zaGFwZSweC5kdHlwZSk7XG4gIHJldHVybiBiYWNRZW5kLm1ha2VUZW5zb3JJbmZvKCRzaXplLCB4LmR0eXBILCBvdXRWYWxzKTtcbn1cb1xuZXhw3J0IGNvbnN0IHNsaWNlQ29uZmlnOiBLZXJwZmFzc2VmaWcgPSB7XG4gIGtcm5lbe5hbWU6IFNsaWNlFxcuICBiYWNRZW5kTmFtZTogJ2NwdScsXG4gIGtcm5lbeZ1bmM6IHNsaWNlIGFzIHt9IGFzIEtcm5lbeZ1bmNcbn07XG4iXX0=","/\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the "License");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an "AS IS" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {sliceImplCPU} from
'./kernel_utils/shared';\n\nexport function slice(\n args: {inputs: SliceInputs, attrs: SliceAttrs, backend:
BackendWasm}) {\n const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n const [begin_, size_] =
slice_util.parseSliceParams(x, begin, size);\n\n const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);\n\n const xVals = backend.readSync(x.dataId);\n\n const out = backend.makeOutput(size_, x.dtype);\n\n const
xStrides = util.computeStrides(x.shape);\n\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous)
{\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n
outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n\n outData.stringBytes = res as Uint8Array[];\n\n return
out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n\n const rank = x.shape.length;\n\n if (rank === 2)
{\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as
[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
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number, number, number}): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)\n {\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const xTransposed = transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n const xTransposedReshaped = reshape({inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n const result = slice({inputs: {x: xTransposedReshaped}, backend, attrs: {begin: sliceBeginCoords, size: sliceSize}});\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n args: {\n inputs: CastInputs,\n attrs: CastAttrs,\n backend: BackendWasm\n}): TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *

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=====\n\n*\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n
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=====\n\n*\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmClip: (xId: number, min:\n number, max: number, outId: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmClip =\n backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', //\n max\n 'number' // out_id\n]);\n function clip(args: {\n inputs: ClipByValueInputs,\n backend:\n BackendWasm,\n attrs: ClipByValueAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId,\n clipValueMin, clipValueMax, outId);\n return out;\n }\n export const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as\n KernelFunc\n };}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *\n
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=====\n\n*\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from\n '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\nexport function\n concat(\n args: {\n inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs\n }) {\n const {inputs, backend}\n = args;\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n let outShape =\n backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n // Keep only non-empty tensors (ignore tensors\n with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length ===\n 1) {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n const out = backend.makeOutput(outShape,\n inputs[0].dtype);\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n const shapes =\n $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n if ($inputs[0].dtype ===\n 'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-\n dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors\n // into a two-dimensional tensor by\n // collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n // the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize =\n util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t},\n
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backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals:\n backend.readSync(t.dataId, shape: t.shape);\n });\n\n // Concat 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat =\n inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape,\n inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const\n outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes =\n backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n });\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims =\n 0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input =>\n backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b <\n batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const\n innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset,\n inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return\n out;\n\n export const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n };\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from\n * '@tensorflow/tfjs-core';\n *import {BackendWasm} from '../backend_wasm';\n *let wasmConv2d: (\n * xId:\n * number, batchSize: number, inputHeight: number, inputWidth: number,\n * filterId: number, filterHeight: number,\n * filterWidth: number, padTop: number,\n * padRight: number, padBottom: number, padLeft: number, isSamePad:\n * number,\n * dilationHeight: number, dilationWidth: number, strideHeight: number,\n * strideWidth: number,\n * inputChannels: number, outputChannels: number,\n * outId: number) => void;\n *function setup(backend:\n * BackendWasm) {\n * wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n * 'number', // xId\n * 'number', // batchSize\n * 'number', // inputHeight\n * 'number', // inputWidth\n * 'number', // filterId\n * 'number',\n * // filterHeight\n * 'number', // filterWidth\n * 'number', // padTop\n * 'number', // padRight\n * 'number', //\n * padBottom\n * 'number', // padLeft\n * 'number', // isSamePad\n * 'number', // dilationHeight\n * 'number', //\n * dilationWidth\n * 'number', // strideHeight\n * 'number', // strideWidth\n * 'number', // inputChannels\n * 'number',\n * // outputChannels\n * 'number', // outId\n *]);\n *}\n *\n *function conv2d(\n * args: {inputs: Conv2DInputs, backend:\n * BackendWasm, attrs: Conv2DAttrs}) {\n * const {inputs, attrs, backend} = args;\n * const {x, filter} = inputs;\n * const xId = backend.dataIdMap.get(x.dataId).id;\n * const filterId = backend.dataIdMap.get(filter.dataId).id;\n * const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n * const $dataFormat =\n * backend_util.convertConv2DDataFormat(dataFormat);\n * const convInfo = backend_util.computeConv2DInfo(\n * (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n * pad, dimRoundingMode, false,\n * $dataFormat);\n * const filterHeight = convInfo.filterHeight;\n * const filterWidth = convInfo.filterWidth;\n * const\n * padTop = convInfo.padInfo.top;\n * const padRight = convInfo.padInfo.right;\n * const padBottom =\n * convInfo.padInfo.bottom;\n * const padLeft = convInfo.padInfo.left;\n * const dilationHeight =\n * convInfo.dilationHeight;\n * const dilationWidth = convInfo.dilationWidth;\n * const strideHeight =\n * convInfo.strideHeight;\n * const strideWidth = convInfo.strideWidth;\n * const inputChannels =\n * convInfo.inChannels;\n * const outputChannels = convInfo.outChannels;\n * const isSamePad = convInfo.padInfo.type\n * === 'SAME' ? 1 : 0;\n * if (convInfo.dataFormat !== 'channelsLast') {\n * throw new Error(\n * `wasm backend

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Conv2D does not support dataFormat:" +\n `${convInfo.dataFormat}'. Please use 'channelsLast.');\n }\n\nconst out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n)\n\nexport
const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride:
number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend:
BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n
const { backend, inputs, attrs } = args;\n const { dy, filter } = inputs;\n const { strides, pad, dataFormat,
dimRoundingMode, inputShape } = attrs;\n\n const dilations = 1;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,
false /* depthwise */, $dataFormat);\n\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n
inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =
convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -
convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =
util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,
fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =
isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const
xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =
isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const
yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,
'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =
backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n

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inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,\n xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:\n conv2DBackpropInput as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n * \n =====\n\n *\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * \n WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n * \n =====\n\n *\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n", "/**\n * \n @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * \n * \n http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * \n WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n * \n =====\n\n *\n\nimport { CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,\n TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { cast }\n from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes:\n number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,\n extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n 'number', // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { method,\n extrapolationValue, cropSize } = attrs;\n const { image, boxes, boxInd } = inputs;\n const numBoxes =\n boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =\n [numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =\n backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =\n cast({ backend, inputs: { x: image }, attrs: { dtype: 'float32' }});\n imagesData =\n backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =\n backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n const

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out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const
imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n
imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n
InterpolationMethod[method as { } as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if
(castedData != null) {\n backend.disposeData(castedData.dataId);\n } \n\n return out;\n}\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: cropAndResize as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
 './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n
'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n
'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,
exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if
(permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const
permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum',
[permutedAxis], xRank);\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const
permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CppDType[x.dtype]);\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number,

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outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n
'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n
'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs:
DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const
outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth =
inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize,
outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const
out = backend.makeOutput(outputShape, 'float32');\n const xData = backend.dataIdMap.get(x.dataId);\n const
xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number,
inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:
number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:
number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number,
outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', //
xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', //
filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction
depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs:
DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
{strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations === null ? [1, 1] : dilations;\n\n
const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape,
strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =

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convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if
(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative
does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,
padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,
inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n", "/*\n * @license\n
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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\ncreateBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from
'./Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} =
attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if
(dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim
+ 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape:
newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out =
backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as
number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName:
'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch:
number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as
KernelFunc,\n setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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=====\n\n*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n", "/*\n\n * @license\n\n * Copyright 2019 Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the\n\n * \"License\");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or agreed to in writing, software\n\n * distributed under the License is distributed on an\n\n * \"AS IS\" BASIS,\n\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for the specific language governing permissions and\n\n * limitations under the License.\n\n *
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=====\n\n*\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\n\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n\n", "/*\n\n * @license\n\n * Copyright 2019 Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the\n\n * \"License\");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or agreed to in writing, software\n\n * distributed under the License is distributed on an\n\n * \"AS IS\" BASIS,\n\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for the specific language governing permissions and\n\n * limitations under the License.\n\n *
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=====\n\n*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n\n xId: number, meanId: number, varianceId: number, offsetId: number,\n\n scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n\n wasmBatchNorm = backend.wasm.cwrap(\n\n FusedBatchNorm, null /* void */,\n\n ['number', 'number', 'number', 'number', 'number', 'number']);\n\n}\n\nfunction fusedBatchNorm(args: {\n\n backend: BackendWasm,\n\n inputs: FusedBatchNormInputs,\n\n attrs: FusedBatchNormAttrs\n\n}): TensorInfo {\n\n const {backend, inputs, attrs} = args;\n\n const {varianceEpsilon} = attrs;\n\n const {x, mean, variance, offset, scale} = inputs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n\n // Short-circuit zero-sized tensors.\n\n if (util.sizeFromShape(x.shape) === 0) {\n\n return out;\n\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n\n xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n\n return out;\n\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n\n kernelName: FusedBatchNorm,\n\n backendName: 'wasm',\n\n setupFunc: setup,\n\n kernelFunc: fusedBatchNorm as {\n\n KernelFunc\n\n};\n\n", "/*\n\n * @license\n\n * Copyright 2019 Google LLC. All Rights Reserved.\n\n * Licensed under the Apache License, Version 2.0 (the\n\n * \"License\");\n\n * you may not use this file except in compliance with the License.\n\n * You may obtain a copy of the License at\n\n * http://www.apache.org/licenses/LICENSE-2.0\n\n * Unless required by applicable law or agreed to in writing, software\n\n * distributed under the License is distributed on an\n\n * \"AS IS\" BASIS,\n\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n\n * See the License for the specific language governing permissions and\n\n * limitations under the License.\n\n *
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=====\n\n*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedConv2d: (\n\n xId: number, batchSize: number, inputHeight:
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number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,
padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,
dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\nfunction
fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n
FusableActivation[activation as {}] as keyof typeof FusableActivation;\n if (fusedActivation == null) {\n throw
new Error(\n ` ${activation} activation not yet supported for FusedConv2D ` +\n ` in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels
(${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support
dataFormat:` +\n ` ${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n }\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport { backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from './backend_wasm';\n\nimport { FusibleActivation } from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:
number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
 void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\n function
fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n }) {\n const { inputs, attrs, backend } = args;\n const { x, filter, bias,
preluActivationWeights } = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
 dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
 pad, dimRoundingMode, true /* depthwise */);\n const fusedActivation =\n FusibleActivation[activation as]\n as key of type of FusibleActivation);\n if (fusedActivation == null) {\n throw new Error(\n `${activation}\n
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const
outputChannels = convInfo.outChannels;\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n
 if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape\n
(${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels}).`);\n }\n
 biasId = biasData.id;\n }\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support\n
dataFormat:` +\n `${dataFormat}`. Please use 'NHWC'.`);\n }\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n wasmFusedDepthwiseConv2d(\n xId, batchSize,\n inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,\n isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n return out;\n }\n\n export const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n };
}
\n\n * @license\n

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for  
the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from './Reshape';\nimport {CppType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const
```

```

indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape =
[\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n }\n\n const stridesSize = flattenX.shape.length - 1;\n const xData =
backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n
backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =
shapeInfo.outputShape;\n return out;\n }\n\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:
GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", "/**\n
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport { Greater, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\ncreateBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n", "/**\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig }
from '/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n\n", "/**\n
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport { KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { CppDType } from
'/types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n]);\n\n \n\nexport function leakyRelu(\n args: {\n inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm\n }):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =

```

```
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either\n float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)\n !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha,\n outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
```

OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmMax: (xId:\n number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:\n BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n\n function max(args: { backend:\n BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { reductionIndices: axis, keepDims } = attrs;\n const { x } = inputs;\n const xId =\n backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes, originalAxes,\n inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =\n transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max',\n axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the\n transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const\n newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n }\n\n export const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as { } as KernelFunc\n };}\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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```

```
=====\n\n*\n\nimport { KernelConfig, Maximum } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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```

```
=====\n\n*\n\nimport { backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util }\n from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmMaxPool: (\n xId:\n number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:\n number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:\n number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =\n backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //\n
```

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inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //
padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number',
// inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */
\n\n
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n
backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n

```

```

cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});
inputId =
backend.dataIdMap.get(castedInput.dataId).id;
}
const out = backend.makeOutput(outShape, 'float32');
if
(util.sizeFromShape(input.shape) !== 0) {
const outId = backend.dataIdMap.get(out.dataId).id;
wasmMean(inputId, reduceSize, outId);
}
if (inputWasTransposed) {
// dispose of the transposed
tensor.
backend.disposeData(transposed.dataId);
}
if (keepDims) {
// reshape
const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);
out.shape = newShape;
}
if (input.dtype
!== 'float32') {
backend.disposeData(castedInput.dataId);
}
return out;
}
export const meanConfig:
KernelConfig = {
kernelName: Mean,
backendName: 'wasm',
setupFunc: setup,
kernelFunc: mean as {
as KernelFunc
};
}
, "/*
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on an "AS IS" BASIS,
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.
* See the License for the specific language governing permissions and
* limitations under the
License.
*

```

```

=====
*
import {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';
import {BackendWasm} from '../backend_wasm';
import
 {permuteAxesAndTranspose} from './kernel_utils';
import {CppType} from './types';
let wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>
void;
function setup(backend:
BackendWasm): void {
wasmMin = backend.wasm.cwrap(Min, null /*void*/, [
number, // x_id
number, // dtype
number, // reduce_size
number, // out_id
]);
}
function min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):
TensorInfo {
const {backend, inputs, attrs} = args;
const {axis, keepDims} = attrs;
const {x} = inputs;
const xId = backend.dataIdMap.get(x.dataId).id;
let
inputId = xId;
let input = x;
const {transposed, axes, originalAxes, inputWasTransposed} =
permuteAxesAndTranspose(x, axis, backend);
if (inputWasTransposed) {
const transposedId =
backend.dataIdMap.get(transposed.dataId).id;
if (transposedId !== xId) {
// transpose was not a no-op. We
will need to dispose of this
// once we are done.
input = transposed;
inputId = transposedId;
}
}
const inputRank = input.shape.length;
backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);
const [outShape, reduceShape] =
backend_util.computeOutAndReduceShapes(input.shape,
axes);
const reduceSize = util.sizeFromShape(reduceShape);
const out = backend.makeOutput(outShape,
input.dtype);
if (util.sizeFromShape(input.shape) !== 0) {
const outId =
backend.dataIdMap.get(out.dataId).id;
wasmMin(inputId, CCppType[x.dtype], reduceSize, outId);
}
if
(inputWasTransposed) {
// dispose of the transposed tensor.
backend.disposeData(transposed.dataId);
}
if (keepDims) {
// reshape
const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);
out.shape = newShape;
}
return out;
}
export const minConfig: KernelConfig = {
kernelName: Min,
backendName: 'wasm',
setupFunc: setup,
kernelFunc: min as {
as
KernelFunc
};
}
, "/*
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*

```

```

=====
*
import {KernelConfig, Minimum} from '@tensorflow/tfjs-core';
import {createBinaryKernelConfig} from
 './binary_kernel';
const supportsFullBroadcast = false;
export const minimumConfig: KernelConfig =
createBinaryKernelConfig(Minimum, supportsFullBroadcast);
}
, "/*
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```

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```
=====\n*\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode { \n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction\n setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n\n function\n mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n }) {\n const\n {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /*\n beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(outShape, x.dtype);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const\n xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat =\n paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const\n postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,\n MirrorPaddingMode[mode], outId);\n }\n\n return out;\n }\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {\n }\n as KernelFunc,\n setupFunc:\n setup\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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```
=====
*
import { BackendWasm } from './backend_wasm';
// Analogous to `struct Result` in
`non_max_suppression_impl.h`
interface Result {
 pSelectedIndices: number;
 selectedSize: number;
 pSelectedScores: number;
 pValidOutputs: number;
}
/**
 * Parse the result of the c++ method, which has the
 * shape equivalent to `Result`
 *
 * @export function parseResultStruct(
 * backend: BackendWasm, resOffset:
 * number): Result {
 * const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);
 * const
 * pSelectedIndices = result[0];
 * const selectedSize = result[1];
 * const pSelectedScores = result[2];
 * const
 * pValidOutputs = result[3];
 * // Since the result was allocated on the heap, we have to delete it.
 * backend.wasm._free(resOffset);
 * return {pSelectedIndices, selectedSize, pSelectedScores,
 * pValidOutputs};
 * }
 */
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 *
=====
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```
=====
*
import { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
 NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';
import { BackendWasm } from
 './backend_wasm';
import { parseResultStruct } from './NonMaxSuppression_util';
let wasmFunc: (
 boxesId: number, scoresId: number, maxOutputSize: number,
 iouThreshold: number, scoreThreshold: number)
=> number;
function setup(backend: BackendWasm): void {
 wasmFunc = backend.wasm.cwrap(
 NonMaxSuppressionV3,
 'number', // Result
 ['number', // boxesId
 'number', // scoresId
 'number', // maxOutputSize
 'number', // iouThreshold
 'number', // scoreThreshold
];
);
 function kernelFunc(args: {
 backend: BackendWasm,
 inputs: NonMaxSuppressionV3Inputs,
 attrs:
 NonMaxSuppressionV3Attrs
 }): TensorInfo {
 const { backend, inputs, attrs } = args;
 const { iouThreshold,
 maxOutputSize, scoreThreshold } = attrs;
 const { boxes, scores } = inputs;
 const boxesId =
 backend.dataIdMap.get(boxes.dataId).id;
 const scoresId = backend.dataIdMap.get(scores.dataId).id;
 const
 resOffset =
 wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);
 const
 { pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs } =
 parseResultStruct(backend, resOffset);
 // Since we are not using scores for V3, we have to delete it from the heap.
 backend.wasm._free(pSelectedScores);
 backend.wasm._free(pValidOutputs);
 const selectedIndicesTensor
 =
 backend.makeOutput([selectedSize], 'int32', pSelectedIndices);
 return
 selectedIndicesTensor;
 }
 export const nonMaxSuppressionV3Config: KernelConfig = {
 kernelName:
 NonMaxSuppressionV3,
 backendName: 'wasm',
 setupFunc: setup,
 kernelFunc: kernelFunc as { } as
 KernelFunc,
 };
}
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 *
=====
```

```
=====
*
import { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
```



```

NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n\n function nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,\n validOutputsTensor];\n }\n\n export const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {\n } as KernelFunc,\n };
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=====\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,\nNonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n(boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n]);\n\n function kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
=\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId,\n maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize,\n pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using
validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const
selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return
[selectedIndicesTensor, selectedScoresTensor];\n }\n\n export const nonMaxSuppressionV5Config: KernelConfig =
{\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc
as {\n } as KernelFunc,\n };
}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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```

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```
=====\n*\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\nfunction oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n return out;\n}\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as\n {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as\n {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} =
attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n
util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n
util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n
intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n }\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright
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=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n
'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n
]);\n}\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-
circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n
return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n}\n\nconst
xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const
outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as
KernelFunc,\n setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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```

=====
*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
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=====

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=====
*\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {cast} from './Cast';\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' //
out_id\n]);\n\n function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend}
= args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if
(input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n }\n\n export const preluConfig:
KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as
KernelFunc\n };
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*\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n\n function prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
= inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n

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wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of\n the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const\n newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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=====\n\n*\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from '../backend_wasm';\nimport { rangeImplCPU } from '../kernel_utils/shared';\n\nexport const\n range =\n (args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n const { backend, attrs } =\n args;\n const { start, stop, step, dtype } = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const out = backend.makeOutput([values.length], dtype);\n const outVals =\n backendtypedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig:\n KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as\n KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
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=====\n\n*\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n", "/**\n * @license\n * Copyright 2019 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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=====\n\n*\n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport { KernelConfig, Relu6 } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from\n './unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/**\n *
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```
=====\n*\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number', // outId\n]);\n\n function resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n }): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData =\n backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n const out =\n backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n }\n\n export const\n resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n };
}\n\n\"/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n 'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number', // out_id\n]);\n\n export function reverse(\n args: {\n inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs\n }): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n const axes = util.parseAxisParam(dims, x.shape);\n if (x.shape.length === 0) {\n return identity({inputs: {x}, backend});\n }\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n wasmReverse(\n xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
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outId);\n\n const reshaped =\n reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmRotate: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues =\n typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n
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*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/**\n *
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*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppDType} from
'./types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', //
sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n
'number' // outId\n]);\n\n function scatterNd(\n args: {\n backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs\n }):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices,
updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if
(util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides,
outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData =
backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize,
stridesBytes, outputSize, outId);\n\n return out;\n }\n\n export const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number,
offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n
'number', // offset\n 'number', // outId\n]);\n\n function select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1:\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n }\n\n export
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {}
as KernelFunc,\n setupFunc: setup\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights

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=====\n*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs});\nTensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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=====\n*\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from '../unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs});\nTensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { padV2Config } from './PadV2';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { blockShape, paddings } = attrs;\n const prod = util.sizeFromShape(blockShape);\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n const paddedX = padV2Config.kernelFunc({\n inputs: { x },\n backend,\n attrs: { paddings: completePaddings, constantValue: 0 }\n }) as TensorInfo;\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n const reshapeInputs: ReshapeInputs = { x: paddedX };\n const reshapeAttrs: ReshapeAttrs = { shape: reshapedPaddedShape };\n const paddedXReshaped =\n reshape({ inputs: reshapeInputs, backend, attrs: reshapeAttrs });\n const transposeInputs: TransposeInputs = { x: paddedXReshaped };\n const transposeAttrs: TransposeAttrs = { perm: permutedReshapedPaddedPermutation };\n const paddedXT =\n transpose({ inputs: transposeInputs, backend, attrs: transposeAttrs });\n const resultReshapeInputs: ReshapeInputs = { x: paddedXT };\n const resultReshapeAttrs: ReshapeAttrs = { shape: flattenShape };\n const result = reshape(\n { inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs });\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

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=====\n*\n\nimport { KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util } from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { slice } from './Slice';\n\nexport function splitV(\n args: {\n inputs: SplitVInputs,\n attrs: SplitVAttrs,\n backend: BackendWasm\n }) {\n const { inputs, attrs, backend } = args;\n const { x } = inputs;\n const { numOrSizeSplits, axis } = attrs;\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] = s;\n const xSlice =\n slice({ inputs: { x }, attrs: { begin, size: xSliceSize }, backend });\n begin[$axis] += s;\n return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES
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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n\n*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const squaredDifferenceConfig: KernelConfig =\n\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n\n 'number', // x_id\n\n 'number', // alpha\n\n 'number', // dtype\n\n 'number', // out_id\n\n]);\n\n function step(\n\n args: {\n\n backend: BackendWasm,\n\n inputs: StepInputs,\n\n attrs: StepAttrs,\n\n }): TensorInfo {\n\n const {backend, inputs, attrs} = args;\n\n const {alpha} = attrs;\n\n const {x} = inputs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStep(xId, alpha, CCppType[x.dtype], outId);\n\n return out;\n\n }\n\n export const stepConfig: KernelConfig = {\n\n kernelName: Step,\n\n backendName: 'wasm',\n\n setupFunc: setup,\n\n kernelFunc: step as {} as KernelFunc\n\n }; }\n\n", "/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport { KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\nimport { reshape } from
 './Reshape';\nimport { slice } from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,
xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes:
 Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction
 setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n
 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //
 outShapeLength\n 'number', // outId\n]);\n\n export function stridedSlice(args: {\n backend: BackendWasm,\n
 inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n }): TensorInfo {\n const { backend, inputs, attrs } = args;\n
 const { x } = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n
 newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n
 sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n
 x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n
 let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({ inputs: { x },
 backend, attrs: { shape: finalShape }});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is
 memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have
 rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n
 // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({ inputs: { x },
 backend, attrs: { begin: $begin, size }});\n result =\n reshape({ inputs: { x: sliced }, backend, attrs: { shape:
 finalShape }});\n backend.disposeData(sliced.dataId);\n } else {\n const out =
 backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
 xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes
 = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new
 Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const
 outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes =
 new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =
 backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,
 beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
 result = reshape({ inputs: { x: out }, backend, attrs: { shape: finalShape }});\n backend.disposeData(out.dataId);\n
 }\n\n return result;\n }\n\n export const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n
 backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as { } as KernelFunc\n };
 }\n\n /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
 copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */
 }\n\n =====\n\n *\n\n import { KernelConfig, Sub } from '@tensorflow/tfjs-core';\n import { createBinaryKernelConfig } from
 './binary_kernel';\n const supportsFullBroadcast = true;\n export const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n\n /**\n * @license\n * Copyright 2019 Google LLC. All
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */
 }\n

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*/\n\nimport { backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n
'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction sum(args: { backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n
const { axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n inputId = xId;\n let input = x;\n const { transposed, axes, originalAxes, inputWasTransposed } =\n
permuteAxesAndTranspose(x, axis, backend);\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was
not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,\n
input.shape.length);\n }\n }\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes,\n
input.shape.length);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
=====
*/\n\nimport { KernelConfig, Tan } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */
=====
*/\n\nimport { KernelConfig, Tanh } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

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*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTile: (\n xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', //
x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n
]);\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} =
attrs;\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n const out =
backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: tile as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x_shape\n 'number',
// x_shape.length\n 'number', // x_dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n
'number', // outIndicesId\n]);\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n
const {k, sorted} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n
const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices =
backend.makeOutput(outputShape, 'int32');\n const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n wasmTopK(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: topk as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from

```

```
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n imageId:\n number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth:\n number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number)\n=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform,\n null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', //\n imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', //\n interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n]);\n}\n\nfunction transform(\n args: {\n backend: BackendWasm, inputs: TransformInputs, attrs:\n TransformAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n const [batch, imageHeight, imageWidth,\n numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :\n [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as\n [number, number, number, number];\n const strides =\n new Uint8Array(new\n Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out = backend.makeOutput(outShape,\n image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData =\n backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData =\n backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const\n interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n }\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,\n fillModeId, fillValue,\n outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as\n KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```
=====\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from\n '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from\n './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs});\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis <\n 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank =\n value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank;\n i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n\n const outs: TensorInfo[] = new\n Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size},\n backend});\n }\n\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n }\n\n export const\n unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as\n KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
```

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```
=====
*\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend:\nBackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const\nzerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike\n} as KernelFunc;\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n=====\n*\n//
```

We explicitly import the modular kernels so they get registered in the global registry when we compile the library. A modular build would replace the contents of this file and import only the kernels that are needed.

```
\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {fusedMatMulConfig}\nfrom './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from\n './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport\n{anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig}\nfrom './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport\n{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport\n{ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport\n{concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport\n{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from\n './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from\n './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}\nfrom './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from\n './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from\n './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from\n './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from\n './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from\n './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport\n{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from\n './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport\n{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport\n{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport\n{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport\n{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport\n{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport\n{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport\n{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from\n './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from\n './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
```



```

./kernels/NonMaxSuppressionV3';\nimport { nonMaxSuppressionV4Config } from
./kernels/NonMaxSuppressionV4';\nimport { nonMaxSuppressionV5Config } from
./kernels/NonMaxSuppressionV5';\nimport { notEqualConfig } from './kernels/NotEqual';\nimport { oneHotConfig }
from './kernels/OneHot';\nimport { onesLikeConfig } from './kernels/OnesLike';\nimport { packConfig } from
./kernels/Pack';\nimport { padV2Config } from './kernels/PadV2';\nimport { powConfig } from
./kernels/Pow';\nimport { preluConfig } from './kernels/Prelu';\nimport { prodConfig } from './kernels/Prod';\nimport
{ rangeConfig } from './kernels/Range';\nimport { realDivConfig } from './kernels/RealDiv';\nimport { reluConfig }
from './kernels/Relu';\nimport { relu6Config } from './kernels/Relu6';\nimport { reshapeConfig } from
./kernels/Reshape';\nimport { resizeBilinearConfig } from './kernels/ResizeBilinear';\nimport { reverseConfig } from
./kernels/Reverse';\nimport { rotateWithOffsetConfig } from './kernels/RotateWithOffset';\nimport { roundConfig }
from './kernels/Round';\nimport { rsqrtConfig } from './kernels/Rsqrt';\nimport { scatterNdConfig } from
./kernels/ScatterNd';\nimport { selectConfig } from './kernels/Select';\nimport { sigmoidConfig } from
./kernels/Sigmoid';\nimport { sinConfig } from './kernels/Sin';\nimport { sliceConfig } from './kernels/Slice';\nimport
{ softmaxConfig } from './kernels/Softmax';\nimport { spaceToBatchNDConfig } from
./kernels/SpaceToBatchND';\nimport { splitVConfig } from './kernels/SplitV';\nimport { sqrtConfig } from
./kernels/Sqrt';\nimport { squareConfig } from './kernels/Square';\nimport { squaredDifferenceConfig } from
./kernels/SquaredDifference';\nimport { stepConfig } from './kernels/Step';\nimport { stridedSliceConfig } from
./kernels/StridedSlice';\nimport { subConfig } from './kernels/Sub';\nimport { sumConfig } from
./kernels/Sum';\nimport { tanConfig } from './kernels/Tan';\nimport { tanhConfig } from './kernels/Tanh';\nimport
{ tileConfig } from './kernels/Tile';\nimport { topKConfig } from './kernels/TopK';\nimport { transformConfig } from
./kernels/Transform';\nimport { transposeConfig } from './kernels/Transpose';\nimport { unpackConfig } from
./kernels/Unpack';\nimport { zerosLikeConfig } from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */\n\n
=====
*/\n\nimport { env } from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */

```

```

*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n]));\n\n**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n]));\n } catch (e) {\n return false;\n }\n});\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.\/this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory=\.\/";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\`path\`
).dirname(scriptDirectory)+\`^`}else{scriptDirectory=__dirname+\`^`}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\`fs\`);if(!nodePath)nodePath=require(\`path\`);filename=n

```

```

odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
'worker_threads' module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !== "undefined" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("/")+1)}else{scriptDirectory=""}}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function

```

```

assert(condition,text){if(!condition){abort("\Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"\Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\string\)return UTF8ToString(ret);if(returnType===\boolean\)return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\number\});var
numericRet=returnType!==\string\;if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++i){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAtAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmM
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=

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Module["wasmMemory"]}]else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors
()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]!="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]!="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=nu
ll}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("Pthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what+="abort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at

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"+"+wasmBinaryFile+""}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)}}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)}}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!E
NVIROMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-
instantiate\"))}})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(rejectPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0})}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu

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rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\\\": \"cancel\\\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emscripten_register_main_browser_thread_id(tb);initWorker:function(){,threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop();if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors();runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\\\": \"exit\\\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_p
thead_self(),-1);postMessage({\"cmd\\\": \"cancelDone\\\"})},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThre
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.

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allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker pthread=null },returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function
n(){delete
PThread pthreads[worker pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker pthread);worker pthread=un
defined}}),runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[_emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[_emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker pthread)PThread.currentProxiedOperationCallerThread=worker pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=$_pthread_self()){var
thread=PThread pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"]);}else{con
sole.error('Internal error! Worker sent a message \''+cmd+' to target pthread '+d["targetThread"]+', but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\processQueuedMainThread
Work\){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\spawnThread\){spawnThread(e.data)}else
if(cmd===\cleanupThread\){cleanupThread(d["thread"]);}else
if(cmd===\killThread\){killThread(d["thread"]);}else
if(cmd===\cancelThread\){cancelThread(d["thread"]);}else
if(cmd===\loaded\){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\print\){out(\Thread \"+d["threadId"]+\":
\"+d["text"]);}else if(cmd===\printErr\){err(\Thread \"+d["threadId"]+\": \"+d["text"]);}else
if(cmd===\alert\){alert(\Thread \"+d["threadId"]+\": \"+d["text"]);}else if(cmd===\exit\){var
detached=worker pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\exitProcess\){try{exit(d["returnCode"]);}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\cancelDone\){PThread.returnWorkerToPool(worker)}else
if(cmd===\objectTransfer\){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\setimmediate\){worker.postMessage(e.data)}else{err(\worker sent an unknown command
\'+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\pthread sent
an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\message\",function(data){worker.onmessage({data:d
ata})});worker.on(\error\",function(data){worker.onerror(data)});worker.on(\exit\",function(data){})}worker.post
Message({\"cmd\":\load\",urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]|_scriptDir,\"wasmMemory\":wasmMe
memory,\"wasmModule\":wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\tfjs-
backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length===0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\\"Assertion failed: \"+UTF8ToString(condition)+\", at:
\'+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function __call_main(argc,argv){var returnCode=_main(argc,argv)}var

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_emsripten_get_now;if(ENVIRONMENT_IS_NODE){_emsripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emsripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!=\"undefined\"){_emsripten_get_now=dateNow}else _emsripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(1,1,func,arg)}function
_emsripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\": \"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\": \"processThreadQueu
e\"})}else {var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\": \"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emsripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emsripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emsripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else {if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emsripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emsripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,addr)}return
0}}function
_emsripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emsripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function _emsripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emsripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emsripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index,numCallArgs,args){_emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function

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emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List))){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";

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if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){ var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){ var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emsripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emsripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emsripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){ return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emsripten_set_canvas_element_size_calling_thread(target,width,height){ var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){ GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){ var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){ canvas.GLctxObject.GLctx.viewport(0,0,width,height)} } else
if(canvas.canvasSharedPtr){ var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1} else{return-4}return 0}function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n _emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){ var
canvas=findCanvasEventTarget(target);if(canvas){ return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)} else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)} }function
_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ex
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1} }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){ return
ext["createVertexArrayOES"]();ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};

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ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra
w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\"\\\"){name=name.slice(0,name.lastIndexOf(\"\\\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"[\"+j+\"\\\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\"default\", \"low-power\", \"high-performance\"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var

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powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iow,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iow,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iow+i*8>>2];var len=GROWABLE_HEAP_I32()[iow+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd\":"run\","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre

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ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\undefined\){err(\Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return
6}if(!pthread_ptr){err(\pthread_create called with a null thread pointer!\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscipten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\spawnThread\;postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\Canceled!\}function
_emscipten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\Blocking on the main thread is very dangerous, see
https://emscipten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\)}function
__emscipten_do_pthread_join(thread,status,block){if(!thread){err(\pthread_join attempted on a null thread
pointer!\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()===thread){err(\PThread
\'+thread+\ is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscipten_main_browser_thread_id()===thread){err(\Main thread
\'+thread+\ is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\pthread_join attempted on thread
\'+thread+\, which does not point to a valid thread, or does not exist anymore!\");return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\Attempted to join thread
\'+thread+\, which was already detached!\");return
ERRNO_CODES.EINVAL}if(block){_emscipten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage(\{cmd\:"cleanupThread",thread\:thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}_pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscipten_main_thre
ad_process_queued_calls();_emscipten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return __emscipten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscipten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case

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235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscript
en_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory|Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap

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ply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["P"]).a
ply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Modu
le["asm"]["Q"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["R"]).apply(null,argument
s)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["
asm"]["S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["T"]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Modul
e["_Conv2DBackpropInput"]=Module["asm"]["U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,argu
ments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]
=Module["asm"]["X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).a
ply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=M
odule["asm"]["Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=M
odule["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments)
};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,ar
guments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,argument
s)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modu
le["asm"]["ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["da"]).apply(null,arg
uments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["ea"]).
apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"]["fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Modu
le["asm"]["ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"]["ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["ia"]).apply(nu
l,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["ja"
]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["ka"]).apply(

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null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"]["\la"]).apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["\ma"]).apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["\na"]).apply(null,arguments));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["\oa"]).apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["\pa"]).apply(null,arguments));var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"]["\qa"]).apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["\ra"]).apply(null,arguments));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["\sa"]).apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["\ta"]).apply(null,arguments));var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["\ua"]).apply(null,arguments));var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["\va"]).apply(null,arguments));var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["\wa"]).apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"]["\xa"]).apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"]["\ya"]).apply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"]["\za"]).apply(null,arguments));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"]["\Aa"]).apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"]["\Ba"]).apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"]["\Ca"]).apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"]["\Da"]).apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"]["\Ea"]).apply(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"]["\Fa"]).apply(null,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"]["\Ga"]).apply(null,arguments));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"]["\Ha"]).apply(null,arguments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"]["\Ia"]).apply(null,arguments));var

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ents});var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"Ja"]).apply(
null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"La"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"Ma"]).apply(
null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"Na"]).apply(
null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"Oa"]).apply(
null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"Pa"]).apply(
null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"Qa"]).apply(
null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Ra"]).apply(
null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Sa"]).apply(
null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ta"]).apply(
null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Ua"]).apply(
null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Va"]).apply(
null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Wa"]).apply(
null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Xa"]).apply(
null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][_"Ya"]).apply(
null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Za"]).apply(
null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][_"a"]).apply(
null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Sa"]).apply(
null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"ab"]).apply(
null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][_"bb"]).apply(
null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][_"cb"]).apply(
null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][_"db"]).apply(
null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][_"eb"]).apply(
null,arguments)};var

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guments));var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][\`f
b\`]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][\`g
b\`]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=
Module["asm"][\`hb\`]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][\`ib\`]).apply(nu
l,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][\`jb\`]).apply(null,arguments
)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_locati
on"]=Module["asm"][\`kb\`]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global
_libc=Module["_emscripten_get_global_libc"]=Module["asm"][\`lb\`]).apply(null,arguments)};var
_pthread_self=Module["_pthread_self"]=function(){return(_pthread_self=Module["_pthread_self"]=Module["as
m"][\`mb\`]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=M
odule["__pthread_tsd_run_dtors"]=Module["asm"][\`nb\`]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_que
ued_calls"]=Module["asm"][\`ob\`]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_proc
ess_queued_calls"]=Module["asm"][\`pb\`]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread
_id"]=Module["asm"][\`qb\`]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_ems
cripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][\`rb\`]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__ems
cripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"][\`sb\`]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm\
"][\`tb\`]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=
Module["asm"][\`ub\`]).apply(null,arguments)};var
__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=function(){return(__emscripten_call_on_t
hread=Module["__emscripten_call_on_thread"]=Module["asm"][\`vb\`]).apply(null,arguments)};var
_emscripten_tls_init=Module["_emscripten_tls_init"]=function(){return(_emscripten_tls_init=Module["_emscri
pten_tls_init"]=Module["asm"][\`wb\`]).apply(null,arguments)};var
__emscripten_thread_init=Module["__emscripten_thread_init"]=function(){return(__emscripten_thread_init=Mod
ule["__emscripten_thread_init"]=Module["asm"][\`xb\`]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][\`yb\`]).a
pply(null,arguments)};var

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if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](0,1));try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"
PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!==\"unwind\")if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel\")if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\")if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href: __filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}};\"\\nvar
WasmBackendModule = (function() {\\n var __scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\\n if (typeof __filename !== 'undefined')
__scriptDir = __scriptDir || __filename;\\n return (\\nfunction(WasmBackendModule) {\\n WasmBackendModule =
WasmBackendModule || {};\\n\\nvar Module=typeof
WasmBackendModule!=='undefined'?WasmBackendModule: {};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\\.this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\\.\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_readAsync=
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return

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nodeFS["readFileSync"](filename,binary?null:"utf8");readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)} assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\");arguments_=process["arg
v"].slice(2);process["on"](["uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}}]);process["on"](["unhandledRejection",abort];quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)} }readBinary=function readBinary(f){ var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs} else if(typeof
arguments!="undefined"){arguments_=arguments} if(typeof
quit==="function"){quit_=function(status){quit(status)} }if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print} } else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href} else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf("/")+1)}else{scriptDirectory=""}}read_=function(url){ var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){ var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)} }readAsync=function(url,onload,onerror){ var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} } else { var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){ var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){ var toC={"string":function(str){ var
ret=0;if(str===null&&str===undefined&&str===0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])} else {cArgs[i
]=args[i]} } var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return

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function(){return ccall(ident,returnType,argTypes,arguments,opts)}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
if(dependenciesFulfilled){var

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callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()) } }Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"\"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+"\"})return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]()["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]()["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"]);function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==="function"){callback(Module);continue}var func=callback.func;if(typeof
func==="number"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var

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overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case
169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var

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_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][\u]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][\v]).apply(null,arguments)};
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][\w]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][\x]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][\y]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][\z]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][\A]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][\B]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][\C]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][\D]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][\E]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][\F]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][\G]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][\H]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][\I]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][\J]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][\K]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][\L]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][\M]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][\N]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][\O]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][\P]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][\Q]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][\R]).apply(null,arguments)};var

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_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][["W"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][["X"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["Y"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["Z"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["_"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][["$"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["aa"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["ba"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ca"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["da"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["ea"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments)};var

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_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_RelU=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_RelU6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][_"za"]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][_"Aa"]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][_"Ba"]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][_"Ca"]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][_"Da"]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][_"Ea"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][_"Fa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][_"Ga"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][_"Ha"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][_"Ia"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][_"Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][_"Ka"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][_"La"]).apply(null,arguments)};var

```

```

_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][_"Ma"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][_"Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][_"Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][_"Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][_"Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][_"Ra"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][_"Sa"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][_"Ta"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][_"Ua"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][_"Va"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][_"Wa"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"][_"Xa"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][_"Ya"]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain();
readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun()}if(Module["setStatus"]){Module["setStatus"]("Running..");setTimeout(function(){setTimeout(function(){Module["setStatus"]("");},1);doRun()},1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){Module["preInit"].pop()}}run();\n\n\n return WasmBackendModule.ready\n\n\n);nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*/\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,

```

```

WasmFactoryConfig } from './wasm-out/tfjs-backend-wasm';\nimport { BackendWasmThreadedSimdModule } from
 './wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport { wasmWorkerContents } from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *
util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values
as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return
this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset,
dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n
}\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false
otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n
disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data =
this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n
}\n\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData =
this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n
const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision():
32 {\n return 32;\n }\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n
getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n\n dispose() {\n
this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n this.wasm.PThread.terminateAllThreads();\n }\n
this.wasm = null;\n }\n\n memory() {\n return {unreliable:
false};\n }\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated
elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset
== null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id =
this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,

```



```

wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD
binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully
created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =
null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:
module.cwrap('init', null, []),\n initWithThreadsCount: module.cwrap('init_with_threads_count', null,
['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:
module.cwrap(\n 'register_tensor', null, [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n });\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case
'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ninterface
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\n\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n ' will be removed in a future release.);\n if
(initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n
 '\n `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n }\n wasmPath = path;\n customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * @param js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
```\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * @doc {heading:
'Environment', namespace: 'wasm'}\n */\n\nexport function setWasmPaths(\n  prefixOrFileMap: string | {[key in
WasmBinaryName]?: string},\n  usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n      '\n      `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n      '\n      `tf.ready()`);\n  }\n\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix
= prefixOrFileMap;\n  } else {\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n\n    wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new
Error(\n        `There were no entries found for the following binaries: ` +\n        ` ${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n        ` map providing a path for each binary, or with a string indicating ` +\n
        ` the directory where all the binaries can be found.`);\n    }\n  }\n\n  customFetch = usePlatformFetch;\n}\n\n/**
Used in unit tests. */\n\nexport function resetWasmPath(): void {\n  wasmPath = null;\n  wasmPathPrefix = null;\n
wasmFileMap = {};\n  customFetch = false;\n  initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * @param\n * This must be called before calling

```



```

tf.setBackend('wasm')\n *\nexport function setThreadsCount(numThreads: number) {\n  threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the
backend is intialized.\n *\nexport function getThreadsCount(): number {\n  if (actualThreadsCount === -1) {\n
throw new Error(`WASM backend not initialized.`);\n  }\n  return actualThreadsCount;\n}\n\n",/** @license See the
LICENSE file. *\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport
{version};\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm,
init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\n\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n  const {wasm} = await init();\n  return new
BackendWasm(wasm);\n},
WASM_PRIORITY);\n"],names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup",
"Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceI
mplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2
DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","s
upportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm",
"FusedConv2D","FusedDepthwiseConv2D","GatherNd","gather_util","GatherV2","Greater","GreaterEqual","setup
Func","LeakyRelu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Mini
mum","MirrorPad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5
","kernelFunc","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range"
,"RealDiv","Relu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","scatter_u
til","Select","Sigmoid","Sin","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step",
"StridedSlice","Sub","Sum","Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env"
,"require$$0","require$$1","require$$2","global","require$$3","require$$4","KernelBackend","DataStorage","engin
e","wasmFactoryThreadedSimd","wasmFactory","deprecationWarn","registerBackend"],mappings:";;;;;;;;;;
;;;;;;;;;EAAA;;;;;;;;;;EAAiBA;EACA,IAAY,QAMX;EAND,WAAY,QAAQ;MACIB,6CAAW,CAAA;MACX,yC
AAS,CAAA;MACT,uCAAQ,CAAA;MACR,2CAAU,CAAA;MACV,iDAAa,CAAA;EACf,CAAC,EANW,QAAQ,
KAAR,QAAQ,QAMnB;EAED;EACA,IAAY,iBAQX;EARD,WAAY,iBAAiB;MAC3B,6DAAU,CAAA;MACV,y
DAAQ,CAAA;MACR,2DAAS,CAAA;MACT,2DAAS,CAAA;MACT,mEAAa,CAAA;MACb,+DAAW,CAAA;M
ACX,uDAAO,CAAA;EACT,CAAC,EARW,iBAAiB,KAAjB,iBAAiB;;EC3B7B;;;;;;;;;;EABuBA,IAAI,eAKQ,C
AAC;EAEb,SAAS,KAAC,CAAC,OAAoB;MACjC,eAAe,GAAG,OAAO,CAAC,IAAI,CAAC,KAAC,CAACA,qB
AAY,EAAE,IAAI,aAAa;UACIE,QAAQ;UACR,OAAO;UACP,QAAQ;UACR,QAAQ;UACR,OAAO;UACP,QAA
Q;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OAC
T,CAAC,CAAC;EACL,CAAC;EAED,SAAS,gBAAgB,CAAC,IAIzB;MACC,MAAM,EAAC,MAAM,EAAE,OAA
O,EAAE,KAAC,EAAC,GAAG,IAAI,CAAC;MACTc,MAAM,EAAC,CAAC,EAAE,CAAC,EAAE,IAAI,EAAE,sB
AAsB,EAAC,GAAG,MAAM,CAAC;MAEpD,IAAI,CAAC,CAAC,KAAC,KAAC,SAAS,IAAI,CAAC,CAAC,KA
AK,KAAC,SAAS,EAAE;UACID,MAAM,IAAI,KAAC,CACX,6DAA6D,CAAC,CAAC;OACpE;MAED,MAAM,
EAAC,UAAU,EAAE,UAAU,EAAE,UAAU,EAAE,cAAc,EAAC,GAAG,KAAC,CAAC;MACnE,MAAM,GAAG,
GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC/C,
MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,
CAAC;MAE/C,IAAI,MAAM,GAAG,CAAC,CAAC;MACf,IAAI,IAAI,IAAI,IAAI,EAAE;UACHb,MAAM,QAAQ

```

,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC;UACpD,IAAI,QAAQ,C
AAC,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;cAC/B,MAAM,IAAI,KAAK,CACX,iDAAiD;kBACjD,QAAQ
,QAAQ,CAAC,KAAK,CAAC,MAAM,GAAG,CAAC,CAAC;WACvC;UACD,MAAM,GAAG,QAAQ,CAAC,EA
AE,CAAC;OACtB;MACD,MAAM,wBAAwB,GAAG,sBAAsB,IAAI,IAAI;UAC3D,CAAC;UACD,OAAO,CAAC,
SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC5D,MAAM,eAAe,GACj
B,iBAAiB,CAAC,UAAkD,CAAC,CAAC;MAC1E,IAAI,eAAe,IAAI,IAAI,EAAE;UAC3B,MAAM,IAAI,KAAK,C
ACX,GAAG,UAAU,gDAAgD;cAC7D,sBAAsB,CAAC,CAAC;OAC7B;MAED,MAAM,OAAO,GAAG,UAAU,G
AAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC;MA
CrD,MAAM,QAAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,K
AAK,CAAC,CAAC,CAAC,CAAC;MACtD,MAAM,QAAQ,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,C
AAC;MAE5B,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAAO,EAAE,QAAQ,
CAAC,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;MACvE,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,
GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,WAAW,GAAG,IAAI,UAA
U,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC;MACnE,MAAM,WA
AW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC
;MAEnE,eAAe,CACX,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,GAAG,EAAE,
WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EACIE,UAAU,EAAE,UAAU,EAAE,eAAe,EAAE,MAAM,
EAAE,wBAAwB,EACzE,cAAc,IAAI,CAAC,EAAE,KAAK,CAAC,CAAC;MAEhC,OAAO,GAAG,CAAC;EACb,
CAAC;EAEM,MAAM,iBAAiB,GAAiB;MAC7C,UAAU,EAAEA,qBAAY;MACxB,WAAW,EAAE,MAAM;MAC
nB,SAAS,EAAE,KAAK;MACHB,UAAU,EAAE,gBAAoC;GACjD;;EC7GD;;;;;;;;;;;;;;;WAuBgB,uBAAuB,CACn
C,UAAkB,EAAE,OAAkB;MACxC,IAAI,QAA6D,CAAC;MAEIE,SAAS,SAAS,CAAC,OAAoB;UACrC,QAAQ,G
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B,UAAU,EAAE,OAA2B;GACxC;;EChDD;;;;;;;EAmBO,MAAM,SAAS,GAAiB,uBAAuB,CAACqF,YAAG,CAAC;;ECnBnE;;;;;;;EAqBA,IAAIjF,UACI,CAAC;EAET,SAASJ,OAAK,CAAC,OAAoB;MACjCI,UAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAACKf,gBAAO,EAAE,IAAI,aAAa;UACtD,QAAQ;UACR,QAAQ;UACR,QAAQ;UACR,QAAQ;OACT,CAAC,CAAC;EACL,CAAC;EAED,SAAS,OAAO,CACZ,IAAwE;MAEIE,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,MAAM,EAAC,EAAE,KAAK,EAAE,EAAC,GAAG,EAAC,EAAC,GAAG,IAAI,CAAC;MACvD,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,MAAM,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MACpD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,MAAM,CAAC,KAAK,EAAE,MAAM,CAAC,KAAK,CAAC,CAAC;MAC3D,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,QAAQ,GAAG,MAAM,CAAC,KAAK,CAAC,GAAG,CAAC,CAAC;MACnC,MAAM,KAAK,GAAG5F,aAAI,CAAC,aAAa,CAAC,MAAM,CAAC,KAAK,CAAC,GAAG,QAAQ,CAAC;;MAG1D,IAAIA,aAAI,CAAC,aAAa,CAAC,GAAG,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;UACvC,OAAO,GAAG,CAAC;OACZ;MAEDU,UAAQ,CAAC,GAAG,EA AE,KAAK,EAAE,QAAQ,EAAE,KAAK,CAAC,CAAC;MACtC,OAAO,GAAG,CAAC;EACb,CAAC;EAEM,MAAM,aAAa,GAAiB;MACzC,UAAU,EAAEkF,gBAAO;MACnB,WAAW,EAAE,MAAM;MACnB,SAAS,EAAEtF,OAAK;MACHb,UAAU,EAAE,OAA2B;GACxC;;EC1DD;;;;;;;EAyBA,SAAS,cAAc,CAAC,IAIvB;MACC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;MACnB,MAAM,EAAC,UAAU,EAAE,QAAQ,EAAC,GAAG,KAAK,CAAC;MAErC,MAAM,IAAI,GAAGN,aAAI,CAAC,aAAa,CAAC,UAAU,CAAC,CAAC;MAE5C,MAAM,gBAAgB,GAA4B,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;MAC3D,gBAAgB,CAAC,IAAI,CAAC,GAAI,QAAoC,CAAC,CAAC;MAEhE,KAAK,IAAI,CAAC,GAAG,CAAC,GAAG,UAAU,CAAC,MAAM,EAAE,CAAC,GAAG,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,EAAE,CAAC,EAAE;UAC3D,gBAAgB,CAAC,IAAI,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;OAC/B;MAED,MAAM,OAAO,GAAG,WAAW,CAAC,UAAU,CAAC;UACrC,MAAM,EAAE,EAAC,CAAC,EAAC;UACX,OAAO;UACP,KAAK,EAAE,EAAC,QAAQ,EAAE,gBAAgB,EAAE,aAAa,EAAE,CAAC,EAAC;OACtD,CAAE,CAAC;MAEjB,MAAM,mBAAmB,GACrBe,qBAAY,CAAC,WAAW,CAAC,OAAO,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,EAAE,KAAK,CAAC,CAAC;MAErE,MAAM,iCAAiC,GAAGA,qBAAY,CAAC,WAAW,CAC9D,mBAAmB,CAAC,MAAM,EAAE,UAAU,CAAC,MAAM,EAAE,KAAK,CAAC,CAAC;MAE1D,MAAM,YAAY,GACdA,qBAAY,CAAC,mBAAmB,CAAC,OAAO,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,EAAE,KAAK,CAAC,CAAC;MAE7E,MAAM,aAAa,GAakB,EAAC,CAAC,EAAE,OAAO,EAAC,CAAC;MACID,MAAM,YAAY,GAAiB,EAAC,KAAK,EAAE,mBAAmB,EAAC,CAAC;MACHe,MAAM,eAAe,GACjB,OAAO,CAAC,EAAC,MAAM,EAAE,aAAa,EAAE,OAAO,EAAE,KAAK,EAAE,YAAY,EAAC,CAAC,CAAC;MAEnE,MAAM,eAAe,GAAoB,EAAC,CAAC,EAAE,eAAe,EAAC,CAAC;MAC9D,MAAM,cAAc,GACC,EAAC,IAAI,EAAE,iCAAiC,EAAC,CAAC;MAC/D,MAAM,QAAQ,GACV,SAAS,CAAC,EAAC,MAAM,EAAE,eAAe,EAAE,OAAO,EAAE,KAAK,EAAE,cAAc,EAAC,CAAC,CAAC;MAEzE,MAAM,mBAAmB,GAakB,EAAC,CAAC,EAAE,QAAQ,EAAC,CAAC;MACzD,MAAM,kBAakB,GAAiB,EAAC,KAAK,EAAE,YAAY,EAAC,CAAC;MAC/D,MAAM,MAAM,GAAG,OAAO,CACIB,EAAC,MAAM,EAAE,mBAAmB,EAAE,OAAO,EAAE,KAAK,EAAE,kBAakB,EAAC,CAAC,CAAC;MAEvE,OAAO,CAAC,WAAW,CAAC,OAAO,CAAC,MAAM,CAAC,CAAC;MACpC,OAAO,CAAC,WAAW,CAAC,eAAe,CAAC,MAAM,CAAC,CAAC;MAC5C,OAAO,CAAC,WAAW,CAAC,QAAQ,CAAC,MAAM,CAAC,CAAC;MAErC,OAAO,MAAM,CAAC;EACHb,CAAC;EAEM,MAAM,oBAAoB,GAAiB;MACHd,UAAU,EAAE2F,uBAAc;MAC1B,WAAW,EAAE,MAAM;MACnB,UAAU,EAAE,cAAc;GAC/C;;ECrFD;;;;;;;WAwBgB,MAAM,CACIB,IAAsE;MACxE,MAAM,EAAC,MAAM,EAAE,KAAK,EAAE,OAAO,EAAC,GAAG,IAAI,CAAC;MACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;MACnB,MAAM,EAAC,eAAe,EAAE,IAAI,EAAC,GAAG,KAAK,CAAC;MAEtC,MAAM,KAAK,GAAG7F,aAAI,CAAC,cAAc,CAAC,IAAI,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC,CAAC;MAEpD,MAAM,UAAU,GAAGE,qBAAY,CAAC,gBAAgB,CAAC,CAAC,EAAE,eAAe,EAAE,KAAK,CAAC,CAAC;MAC5E,MAAM,KAAK,GAAG,IAAI,KAAK,CAAC,CAAC,CAAC,KAAK,CAAC,MAAM,CAAC,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;MACHd,MAAM,IAAI,GAAG,CAAC,CAAC,KAAK,CAAC,KAAK,EAAE,CAAC;MAC7B,OAAO,UAAU,CAAC,GAAG,CAAC,CAAC;UACrB,MAAM,UAAU,GAAG,CAAC,GAAG,IAAI,CAAC,CAAC;UAC7B,UAAU,CAAC,KAAK,CAAC,GAAG,CAAC,CAAC;UACtB,MAAM,MAAM,GACR,KAAK,CAAC,EAA

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No license file was found, but licenses were detected in source scan.

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* =====*/

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- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Ceil.cc
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- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Elu.h
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- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/elu_impl.h
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/sin_cos_workaround.h
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Any.cc
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/elu_impl.cc
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/All.cc
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/MirrorPad.cc
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/sin_cos_workaround.cc

No license file was found, but licenses were detected in source scan.

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```

=====
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n
'number', // reduce_size\n    'number', // dtype\n    'number', // out_id\n  ]);\n\n  function sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n    inputId = xId;\n    let input = x;\n    const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n    const\n    transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n    // transpose was
not a no-op. We will need to dispose of this\n    // once we are done.\n    input = transposed;\n    inputId =
transposedId;\n    reductionAxes = backend_util.getInnerMostAxes(\n      reductionAxes.length,\n      input.shape.length);\n    }\n  }\n\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,\n    input.shape.length);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CCppType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sum as {} as KernelFunc\n};\n"}

```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sum.js.map
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No license file was found, but licenses were detected in source scan.

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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
*/\\n// This enum must align with the enum defined in cc/backend.h.\\nexport enum CppDType {\\n float32 = 0,\\n
int32 = 1,\\n bool = 2,\\n string = 3,\\n complex64 = 4\\n}\\n// Must match enum in cc/fusable_activations.h.\\nexport
enum FusableActivation {\\n linear = 0,\\n relu = 1,\\n relu6 = 2,\\n prelu = 3,\\n leakyrelu = 4,\\n sigmoid = 5,\\n elu
= 6\\n}\\n"}]
```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/types.js.map
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Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/parcel/index.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/webpack/src/index.js
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```
=====  
*\n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from\n'.binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\ncreateBinaryKernelConfig(RealDiv, supportsFullBroadcast);
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RealDiv.js.map

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```

```
=====  
*\n\nimport { GreaterEqual, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from\n'.binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GreaterEqual.js.map

No license file was found, but licenses were detected in source scan.

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```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\nlet wasmProd: (\n  xId: number, reduceSize: number, dtype: number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n    'number',\n    'number',\n    'number',\n    'number'\n  ]);\n  function prod(args: {\n    backend: BackendWasm,\n    inputs: ProdInputs,\n    attrs: ProdAttrs\n  }): TensorInfo {\n    const { backend, inputs, attrs } = args;\n    const { axis, keepDims } = attrs;\n    const { x } = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n    const { transposed, axes, originalAxes, inputWasTransposed } = permuteAxesAndTranspose(x, axis, backend);\n    let reductionAxes = axes;\n    if (inputWasTransposed) {\n      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId = transposedId;\n        reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length, input.shape.length);\n      }\n    }\n    backend_util.assertAxesAreInnerMostDims('prod', reductionAxes, input.shape.length);\n    const [outShape, reduceShape] = backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n    const reduceSize = util.sizeFromShape(reduceShape);\n    const out = backend.makeOutput(outShape, input.dtype);\n    if (util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n    }\n    if (inputWasTransposed) {\n      // dispose of the transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n    if (keepDims) {\n      // reshape\n      const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n    return out;\n  }\n  export const prodConfig: KernelConfig = {\n    kernelName: Prod,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prod as { } as KernelFunc\n  };\n}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-

wasm/dist/kernels/Prod.js.map

No license file was found, but licenses were detected in source scan.

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","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { KernelConfig, Sqrt } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'./unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"]}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sqrt.js.map

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under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { Identity, IdentityInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport
{ TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nexport function
identity(args: { inputs: IdentityInputs, backend: BackendWasm }):\n  TensorInfo {\n  const { inputs: { x }, backend } =
args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const inVals = backend.typedArrayFromHeap(x);\n  const outVals = backend.typedArrayFromHeap(out);\n  outVals.set(inVals);\n  return out;\n}\n\nexport const
identityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'wasm',\n  kernelFunc: identity as { } as
KernelFunc,\n};\n"]}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-

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No license file was found, but licenses were detected in source scan.

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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nexport
function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:
DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n    void;\n\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*
void */, [\n    'number', // a_id,\n    'array', // a_shape\n    'number', // a_shape.length\n    'number', // b_id\n

```

```

'array', // b_shape\n  'number', // b_shape.length\n  'number', // dtype\n  'number' // out_id\n  ]);\n }\n\nfunction kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):TensorInfo {\n  const {backend,\n  inputs} = args;\n  const {a, b} = inputs;\n  const aId = backend.dataIdMap.get(a.dataId).id;\n  const bId =\n  backend.dataIdMap.get(b.dataId).id;\n  const outputType = dtype != null ? dtype : a.dtype;\n  const newShape =\n  backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n  const out = backend.makeOutput(newShape,\n  outputType);\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(newShape) === 0) {\n    return\n  out;\n  }\n  const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n  const bShapeBytes =\n  new Uint8Array(new Int32Array(b.shape).buffer);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const kernelFunc = () => wasmFunc(\n    aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n    CppDType[a.dtype], outId);\n  // Currently only some float operations support full broadcast.\n  if\n  (supportsFullBroadcast && a.dtype === 'float32') {\n    kernelFunc();\n    return out;\n  }\n  const\n  aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n  const bBroadcastDims =\n  backend_util.getBroadcastDims(b.shape, newShape);\n  const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n  v === i);\n  const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n  if (loopsOverAllOfA &&\n  loopsOverAllOfB) {\n    kernelFunc();\n    return out;\n  } else {\n    throw new Error(\n      `Broadcasting\n      along outer dims is not yet ` +\n      `supported for ${a.dtype} ${kernelName}.`);\n  }\n}\n\nreturn\n  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n\n}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/binary_kernel.js.map

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Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n  args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n  TensorInfo {\n    const {inputs:\n    {x}, attrs: {dtype}, backend} = args;\n    const out = backend.makeOutput(x.shape, dtype);\n    const inVals =\n    backend.typedArrayFromHeap(x);\n    const outVals = backend.typedArrayFromHeap(out);\n    outVals.set(inVals);\n    return out;\n  }\n\nexport const castConfig: KernelConfig = {\n  kernelName: Cast,\n  backendName: 'wasm',\n  kernelFunc: cast as } as KernelFunc,\n};

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cast.js.map

No license file was found, but licenses were detected in source scan.

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Found in path(s):

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No license file was found, but licenses were detected in source scan.

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","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\\n
*/\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n"]}]
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu.js.map

No license file was found, but licenses were detected in source scan.

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====

```
\n */\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from  
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport  
{ permuteAxesAndTranspose } from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:  
number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,  
  null /*void*/, [number, number, number]);\n}\nfunction any(args: { backend: BackendWasm, inputs: AnyInputs,  
  attrs: AnyAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis,  
    backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =  
    util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if  
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n  if (keepDims) {\n    // reshape\n    const newShape =  
    backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n  return  
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:  
  setup,\n  kernelFunc: any as {} as KernelFunc\n};\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Any.js.map

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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\\n

```
*/\n\nimport { backend_util, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from  
 './backend_wasm';\nimport { transpose } from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose  
if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,  
  axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank =  
  x.shape.length;\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const  
  permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let  
  inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n    axes =  
    backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: [x], attrs: {perm:  
permutedAxes}, backend});\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =  
    backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}
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Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.js.map

No license file was found, but licenses were detected in source scan.

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AChB,UAAU,EAAE,UAA8B;CAC3C,CAAC", "sourcesContent":["/*\n * @license\n * Copyright 2019 Google
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,  
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from  
 './backend_wasm';\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number,  
softNmsSigma: number) =>\n   number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =  
  backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //  
scoreThreshold\n      'number', // softNmsSigma\n    ]);\n\n  function kernelFunc(args: {\n    backend:  
BackendWasm,\n    inputs: NonMaxSuppressionV5Inputs,\n    attrs: NonMaxSuppressionV5Attrs\n  }): TensorInfo[]  
 {\n    const { backend, inputs, attrs } = args;\n    const { iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma  
 = attrs;\n    const { boxes, scores } = inputs;\n\n    const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n    const  
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n    const resOffset = wasmFunc(\n      boxesId, scoresId,  
maxOutputSize, iouThreshold, scoreThreshold,\n      softNmsSigma);\n\n    const { pSelectedIndices, selectedSize,  
pSelectedScores, pValidOutputs } =\n      parseResultStruct(backend, resOffset);\n\n    // Since we are not using  
validOutputs for V5, we have to delete it from the\n    // heap.\n    backend.wasm._free(pValidOutputs);\n\n    const  
selectedIndicesTensor =\n      backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n    const  
selectedScoresTensor =\n      backend.makeOutput([selectedSize, 'float32', pSelectedScores);\n\n    return  
[selectedIndicesTensor, selectedScoresTensor];\n  }\n\n  export const nonMaxSuppressionV5Config: KernelConfig =  
 {\n    kernelName: NonMaxSuppressionV5,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: kernelFunc  
 as { } as KernelFunc,\n  };
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/NonMaxSuppressionV5.js.map

No license file was found, but licenses were detected in source scan.

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AC,CAAC", "sourcesContent":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
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```

```
=====\n*\n\nimport { KernelConfig, Relu6 } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from  
 './unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n
```


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```
=====  
*\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' // out_id\n  ]);\n\n  function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n    const {inputs, backend} = args;\n    const {x, alpha} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if (input.dtype !== 'float32') {\n      castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n      inputId = backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype !== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n  }\n\n  export const preluConfig: KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as KernelFunc\n  };  
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.js.map

No license file was found, but licenses were detected in source scan.

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```

```
=====  
*\n\nimport './register_all_kernels';\n\nexport * from './base';  
}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index.js.map

No license file was found, but licenses were detected in source scan.

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```

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```
=====
*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig
=\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/SquaredDifference.js.map

No license file was found, but licenses were detected in source scan.

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the specific language governing permissions and\n * limitations under the License.\n *

```

=====
*\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterId: number, filterHeight: number, filterWidth: number,\n  biasId: number, padTop: number, padRight:
number, padBottom: number,\n  padLeft: number, isSamePad: number, dilationHeight: number,\n  dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, activation: number,\n  preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n  backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n    'number', // xId\n    'number', //
batchSize\n    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterId\n    'number', //
filterHeight\n    'number', // filterWidth\n    'number', // biasId\n    'number', // padTop\n    'number', //
padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', // isSamePad\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n
'number', // inputChannels\n    'number', // outputChannels\n    'number', // activation\n    'number', //
preluActivationWeightsId\n    'number', // leakyreluAlpha\n    'number', // outId\n  ]);\n\nfunction
fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs:
FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias,
preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n    (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n    FusableActivation[activation as {\n  as keyof typeof FusableActivation\n}];\n  if (fusedActivation == null) {\n    throw new Error(\n      `${activation}
activation not yet supported for FusedDepthwiseConv2D`\n    );\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n  const
outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got `${biasData.shape.length}`);\n    }\n\n    if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n
`FusedDepthwiseConv2D bias shape (${biasData.shape}) does not`\n      match the number of output channels (${outputChannels})`);\n    }\n\n    biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth =
convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const
padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =

```

```

convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n   throw new Error(\n     `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n     `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n   xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n   biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n   dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n   fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName: FusedDepthwiseConv2D,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n"}

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/FusedDepthwiseConv2D.js.map

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AAE,SAAS;IACrB,WAAW,EAAE,MAAM;IACnB,UAAU,EAAE,SAA6B;IACzC,SAAS,EAAE,KAAK;CACjB,C
AAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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```
=====\n*\n\nimport { KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode { \n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction\n  setup(backend: BackendWasm) {\n    wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n      'number', // xId\n      'array', // x.shape\n      'number', // x.shape.length\n      'number', // x.dtype\n      'array', // pre-paddings\n      'array', // post-paddings\n      'number', // mode\n      'number', // outId\n    ]);\n  }\n\nfunction\n  mirrorPad(args: {\n    inputs: MirrorPadInputs,\n    backend: BackendWasm,\n    attrs: MirrorPadAttrs\n  }) {\n    const { inputs: { x }, backend, attrs: { paddings, mode } } = args;\n    const outShape = paddings.map((p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(outShape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n    const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n    const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n    const prePaddingsBytes = new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n    const postPaddingsBytes = new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n    wasmMirrorPad(xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes, postPaddingsBytes, MirrorPaddingMode[mode], outId);\n    return out;\n  }\n\nexport const mirrorPadConfig: KernelConfig = {\n  kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as { } as KernelFunc,\n  setupFunc: setup\n};\n\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MirrorPad.js.map

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```
{"version":3,"file":"flags_wasm.js","sourceRoot":"","sources":["../src/flags_wasm.ts"],"names":[],"mappings":"AA\nAA;,,,,,;;GAeG;AAEH,OAAO,EAAC,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAE1C,MAAM,GAAG,GAA\nG,GAAG,EAAE,CAAC;AAE1B;;GAEG;AACH,gEAAgE;AAChE,GAAG,CAAC,YAAY;AACZ,2EAA2E;AAC3E\n,8DAA8D;AAC9D,gBAAgB;AAChB,uBAAuB,EAAE,KAAK,IAAI,EAAE,CAAC,WAAW,CAAC,QAAQ,CAAC,\nIAAI,UAAU,CAAC;IACvE,CAAC,EAAE,EAAE,EAAE,GAAG,EAAE,GAAG,EAAE,CAAC,EAAE,CAAC,EAA\nE,CAAC,EAAE,CAAC,EAAE,CAAC,EAAG,CAAC,EAAE,CAAC,EAAI,EAAE,EAAE,CAAC,EAAG,CAAC,EA\nAE,CAAC;IACrD,CAAC,EAAE,CAAC,EAAG,CAAC,EAAI,EAAE,EAAG,CAAC,EAAE,CAAC,EAAE,CAAC,\nEAAE,CAAC,EAAE,EAAE,EAAE,CAAC,EAAE,GAAG,EAAE,EAAE,EAAE,EAAE,EAAE,EAAE;CACpD,CA\nAC,CAAC,CAAC,CAAC;AAET;;GAEG;AACH,gEAAgE;AAChE,GAAG,CAAC,YAAY,CAAC,8BAA8B,EAAE\n,KAAK,IAAI,EAAE;IAC1D,gEAAgE;IAC1E,iDAAiD;IACjD,IAAI,GAAG,CAAC,GAAG,CAAC,SAAS,CAAC,E\nAAE;QACtB,OAAO,KAAK,CAAC;KACd;IAED,IAAI;QACF,wDAAwD;QACxD,sFAAsF;QACtF,IAAI,cAAc,E\nAAE,CAAC,KAAK,CAAC,WAAW,CAAC,IAAI,iBAAiB,CAAC,CAAC,CAAC,CAAC,CAAC;QACjE,gEAAgE;\nQAC1E,gBAAgB;QAC1B,OAAO,WAAW,CAAC,QAAQ,CAAC,IAAI,UAAU,CAAC;YACzC,CAAC,EAAE,EA\nAE,EAAE,GAAG,EAAE,GAAG,EAAE,CAAC,EAAE,CAAC,EAAG,CAAC,EAAG,CAAC,EAAE,CAAC,EAAE,\nCAAC,EAAE,CAAC,EAAG,EAAE,EAAE,CAAC,EAAI,CAAC,EAAG,CAAC,EAAE,CAAC,EAAE,CAAC,EAA\nG,CAAC,EAAE,CAAC;YACpE,CAAC,EAAE,CAAC,EAAG,CAAC,EAAI,CAAC,EAAI,CAAC,EAAE,EAAE,E\nAAE,EAAE,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,EAAE,EAAE,CAAC,EAAE,EAAE,EAAE,EAAE\n,EAAE,CAAC,EAAE,CAAC,EAAE,EAAE,EAAE,EAAE;SACnE,CAAC,CAAC,CAAC;KACL;IAAC,OAAO,CA\nAC,EAAE;QACV,OAAO,KAAK,CAAC;KACd;AACH,CAAC,CAAC,CAAC","sourcesContent":["/**\n *
```


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```
=====\n*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n *\n * From: https://github.com/GoogleChromeLabs/wasm-feature-detect\n * ENV.registerFlag\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n * WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n * 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n * 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n * ]));\n *\n * True if threads are supported.\n *\n * From: https://github.com/GoogleChromeLabs/wasm-feature-detect\n * ENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //\n * TODO(annxingyuan): Enable node support once this is resolved:\n //\n * https://github.com/tensorflow/tfjs/issues/3830\n * if (ENV.get('IS_NODE')) {\n * return false;\n * }\n * try {\n * //\n * Test for transferability of SABs (needed for Firefox)\n * //\n * https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkZIHETpA/dwsMNchWEQAJ\n * new\n * MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n * // This typed array is a WebAssembly\n * program containing threaded\n * // instructions.\n * return WebAssembly.validate(new Uint8Array([\n * 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n * 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n * ]));\n * } catch (e) {\n * return false;\n * }\n * });\n * }"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/flags_wasm.js.map

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```
***** */
/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 * the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
 */
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.node.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/miniprogram/index.js
```

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```
{"version":3,"file":"FloorDiv.js","sourceRoot":"","sources":["../../src/kernels/FloorDiv.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,QAAQ,EAeE,MAAM,uBAAuB,CAAC;AAE7D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AAEzD,MAAM,qBAAqB,GAAG,KAAG,CAAC;AACpC,MAAM,CAAC,MAAM,cAAc,GACvB,wBAAwB,CAAC,QAAQ,EAeE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *  
=====\n *\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n"]}]
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FloorDiv.js.map
```

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```
{"version":3,"file":"Sub.js","sourceRoot":"","sources":["../src/kernels/Sub.ts"],"names":[],"mappings":"AAAA;;;;  
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AAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,IAAI,CAAC;AACnC,MAAM,CAAC,MAAM,S  
AAS,GACIB,wBAAwB,CAAC,GAAG,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n *  
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=====\n *\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
'./binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n"]}]
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sub.js.map

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 *  
 * =====  
 */
```

Found in path(s):

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/kernel_utils.ts

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```

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```

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 *
 * =====
 */

```

```

/#! *****

```

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```

***** */

```

```

/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 * the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
 */

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.js

```

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```
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=====\  
*\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n  args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n  const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId = backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n  wasmFlipLeftRight(\n    imageId, batch, imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as {} as KernelFunc,\n  setupFunc: setup;\n};\n\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FlipLeftRight.js.map
```

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```
{"version":3,"file":"Elu.js","sourceRoot":"","sources":["../../src/kernels/Elu.ts"],"names":[],"mappings":"AAAA;:::;GAEg;AACH,OAAO,EAAC,GAAG,EAAe,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAc,MAAM,gBAAgB,CAAC;AAEvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
```

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Elu.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Neg.js","sourceRoot":"","sources":["../src/kernels/Neg.ts"],"names":[],"mappings":"AAAA;;;;\n;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Neg.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Sin.js","sourceRoot":"","sources":["../src/kernels/Sin.ts"],"names":[],"mappings":"AAAA;;;;\n;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Square.js","sourceRoot":"","sources":["../../src/kernels/Square.ts"],"names":[],"mappings":"AA
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uB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,YAAY,GAAiB,uBAAuB,CAAC,MAAM,C
AAC,CAAC","sourcesContent":["/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Square.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Minimum.js","sourceRoot":"","sources":["../../src/kernels/Minimum.ts"],"names":[],"mappings"
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C,MAAM,aAAa,GACTb,wBAAwB,CAAC,OAAO,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
\n
*\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"]}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Minimum.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Tan.js","sourceRoot":"","sources":["../../src/kernels/Tan.ts"],"names":[],"mappings":"AAAA;
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AC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAiB,uBAAuB,CAAC,GAAG,CAAC,CA
AC","sourcesContent":["/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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```

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tan.js.map

No license file was found, but licenses were detected in source scan.

```
{\"version\":3,\"file\":\"PadV2.js\",\"sourceRoot\":\"\",\"sources\":[\"../src/kernels/PadV2.ts\"],\"names\":[],\"mappings\":\"AA  
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AAS,EAAE,KAak;CACjB,CAAC\", \"sourcesContent\":[\"/**\n * @license\n * Copyright 2019 Google LLC. All  
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http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-  
core';\nimport {BackendWasm} from './backend_wasm';\nimport {fill} from './Fill';\nimport {CppType}
```

```

from './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n  'number', // xId\n  'array', // x.shape\n  'number', // x.shape.length\n  'number', // x.dtype\n
'array', // pre-paddings\n  'array', // post-paddings\n  'number', // constantValue\n  'number', // outId\n
]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map(\n    (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-
circuit the computation, since x doesn't have value, only\n    // the shape is used to compute output shape to pad.\n
return fill({\n    backend,\n    attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n  });\n}\n\nconst
xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const
outTensorData = backend.dataIdMap.get(out.dataId);\n  const outId = outTensorData.id;\n\n  const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n  new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmPadV2(\n    xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes, constantValue, outId);\n  return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as {} as
KernelFunc,\n  setupFunc: setup\n};\n"}

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/PadV2.js.map

No license file was found, but licenses were detected in source scan.

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 *
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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 * =====
 */

```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FloorDiv.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/setup_test.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherNd.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/RotateWithOffset.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/types.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/LogicalAnd.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ArgMax.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Cast.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Log.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/RealDiv.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sum.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Minimum.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Multiply.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Max.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/_FusedMatMul.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Exp.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedConv2D.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Rsqrt.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GreaterEqual.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Sub.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ExpandDims.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RealDiv.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ArgMax.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AvgPool.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Min.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FloorDiv.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LeakyRelu.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/binary_kernel.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV5.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Greater.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Add.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Rsqrt.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tanh.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Concat.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/binary_kernel.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherV2.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ScatterNd.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Sigmoid.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/GatherNd.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchMatMul.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/NonMaxSuppressionV3.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Exp.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/FusedDepthwiseConv2D.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Multiply.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/NonMaxSuppressionV5.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Cos.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/AddN.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Minimum.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FlipLeftRight.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Log.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tile.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/FusedConv2D.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RealDiv.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/LeakyRelu.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthToSpace.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Tanh.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/unary_kernel.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/index.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/GreaterEqual.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sub.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Maximum.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/SquaredDifference.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tanh.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index_test.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedConv2D.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Concat.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Greater.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchMatMul.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Log.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/FusedBatchNorm.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Unpack.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transpose.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AvgPool.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Add.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Less.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reshape.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index_test.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Abs.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV3.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Conv2D.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/LessEqual.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/binary_kernel.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherNd.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/CropAndResize.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Tile.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sum.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Relu6.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Square.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Max.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Square.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/types.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/unary_kernel.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LeakyRelu.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SquaredDifference.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LessEqual.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Unpack.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/ClipByValue.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RotateWithOffset.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/FloorDiv.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LogicalAnd.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Less.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Slice.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cast.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu6.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ClipByValue.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Prelu.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedDepthwiseConv2D.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/ScatterNd.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FlipLeftRight.d.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/BatchMatMul.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MaxPool.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/CropAndResize.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Sum.ts
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherV2.js
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/FlipLeftRight.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Minimum.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthToSpace.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Conv2D.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/DepthwiseConv2dNative.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedBatchNorm.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RotateWithOffset.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/_FusedMatMul.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/DepthToSpace.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AddN.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ClipByValue.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Min.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cos.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/_FusedMatMul.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MaxPool.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV3.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tile.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Conv2D.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/GatherV2.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sigmoid.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/NonMaxSuppression_util.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/ResizeBilinear.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Greater.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Max.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reshape.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cast.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV5.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Multiply.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Slice.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/PadV2.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Reshape.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/PadV2.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/ArgMax.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LogicalAnd.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthwiseConv2dNative.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Unpack.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Transpose.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/wasm-out/tfjs-backend-wasm.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/types.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Concat.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transpose.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/AddN.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/ExpandDims.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/CropAndResize.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Maximum.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/MaxPool.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Min.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Rsqrt.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ExpandDims.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GreaterEqual.d.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Add.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/unary_kernel.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Less.js

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Abs.ts

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/setup_test.d.ts

- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedDepthwiseConv2D.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Slice.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedBatchNorm.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Sin.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Abs.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/AvgPool.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthwiseConv2dNative.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cos.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Relu.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu6.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Pow.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SquaredDifference.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Exp.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppression_util.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppression_util.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/Square.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ScatterNd.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/PadV2.js
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sigmoid.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LessEqual.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Maximum.d.ts
- * /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sub.js

No license file was found, but licenses were detected in source scan.

```
{ "version": 3, "file": "BatchToSpaceND.js", "sourceRoot": "", "sources": [ "../src/kernels/BatchToSpaceND.ts" ], "names": [], "mappings": "AAAA;:::;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,cAAc,EAAsE,MAAM,uBAAuB,CAAC;AAIxI,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AACIC,OAAO,EAAC,KAAK,EAAC,MAAM,SAAS,CAAC;AAC9B,OAAO,EAAC,SAAS,EAAC,MAAM,aAAa,CAAC;AAEtC,SAAS,cAAc,CAAC,IAIvB;IACC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;IACnB,MAAM,EAAC,UAAU,EAAE,KAAK,EAAC,GAAG,KAAK,CAAC;IAEIC,MAAM,IAAI,GAAG,UAAU,CAAC,MAAM,CAAC,CAAC,CAAC,EAAE,CAAC,EAAE,EAAE,CAAC,CAAC,GAAG,CAAC,CAAC,CAAC;IAEhD,MAAM,QAAQ,GAAG,YAAY,CAAC,WAAW,CAAC,CAAC,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,CAAC,CAAC;IACrE,MAAM,QAAQ,GAAG,YAAY,CAAC,WAAW,CAAC,QAAQ,CAAC,MAAM,EAAE,UAAU,CAAC,MAAM,CAAC,CAAC;IAC9E,MAAM,gBAAgB,GACIB,YAAY,CAAC,mBAAmB,CAAC,CAAC,CAAC,KAAK,EAAE,UAAU,EAAE,IAAI,CAAC,CAAC;IACHe,MAAM,gBAAgB,GACIB,YAAY,CAAC,mBAAmB,CAAC,KAAK,EAAE,UAAU,CAAC,MAAM,CAAC,CAAC;IAC/D,MAAM,SAAS,GACIX,YAAY,CAAC,YAAY,CAAC,gBAAgB,EAAE,KAAK,EAAE,UAAU,CAAC,MAAM,CAAC,CAAC;IAE1E,MA
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```
=====\n*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: BackendWasm,\n  attrs: BatchToSpaceNDAttrs\n}) {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockShape, crops } = attrs;\n\n  const prod = blockShape.reduce((a, b) => a * b);\n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted = backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords = backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize = backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n  const xReshaped = reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n  const xTransposed = transpose({ inputs: { x: xReshaped }, backend, attrs: { perm: permuted } });\n  const xTransposedReshaped = reshape({ inputs: { x: xTransposed }, backend, attrs: { shape: reshapedPermuted } });\n  const result = slice({ inputs: { x: xTransposedReshaped }, backend, attrs: { begin: sliceBeginCoords, size: sliceSize } });\n  backend.disposeData(xReshaped.dataId);\n  backend.disposeData(xTransposed.dataId);\n  backend.disposeData(xReshaped.dataId);\n  return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'wasm',\n  kernelFunc: batchToSpaceND as { } as KernelFunc\n};\n\n}}
```

Found in path(s):

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-
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No license file was found, but licenses were detected in source scan.

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```

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Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { FusableActivation } from
'./types';\n\nlet wasmFusedMatMul: (\n  aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n  bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n  transposeB: boolean, activation: number,

```


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```
=====  
*\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from  
 './unary_kernel';\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * @license  
 * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
 "\License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
 License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or  
 agreed to in writing, software  
 distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
 the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nexport  
function createBinaryKernelConfig(\n  kernelName: string, supportsFullBroadcast: boolean,\n  dtype?:  
  DataType): KernelConfig {\n  let wasmFunc:\n    (aId: number, aShape: Uint8Array, aShapeLen: number, bId:  
    number,\n    bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n      void;\n  function setupFunc(backend: BackendWasm): void {\n    wasmFunc = backend.wasm.cwrap(kernelName, null /*  
    void*/, [\n      'number', // a_id,\n      'array', // a_shape\n      'number', // a_shape.length\n      'array', // b_shape\n      'number', // b_shape.length\n      'number', // dtype\n      'number' // out_id\n    ]);\n  }\n  function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):  
    TensorInfo {\n    const {backend,  
    inputs} = args;\n    const {a, b} = inputs;\n    const aId = backend.dataIdMap.get(a.dataId).id;\n    const bId =  
    backend.dataIdMap.get(b.dataId).id;\n    const outputType = dtype != null ? dtype : a.dtype;\n    const newShape =  
    backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n    const out = backend.makeOutput(newShape,  
    outputType);\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(newShape) === 0) {\n      return  
    out;\n    }\n    const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n    const bShapeBytes =  
    new Uint8Array(new Int32Array(b.shape).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const kernelFunc = () => wasmFunc(\n      aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n      CCppType[a.dtype], outId);\n    // Currently only some float operations support full broadcast.\n    if  
    (supportsFullBroadcast && a.dtype === 'float32') {\n      kernelFunc();\n      return out;\n    }\n    const  
    aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n    const bBroadcastDims =  
    backend_util.getBroadcastDims(b.shape, newShape);\n    const loopsOverAllOfA = aBroadcastDims.every((v, i) =>  
    v === i);\n    const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n    if (loopsOverAllOfA &&  
    loopsOverAllOfB) {\n      kernelFunc();\n      return out;\n    } else {\n      throw new Error(\n        `Broadcasting  
    along outer dims is not yet ` +  
    `supported for ${a.dtype} ${kernelName}.`);\n    }\n  }\n  return  
  {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license  
 * Copyright 2019 Google  
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "\License");\n * you may not  
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,  
 software  
 distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
 the specific language  
 governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from  
 './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const addConfig: KernelConfig =\n  createBinaryKernelConfig(Add, supportsFullBroadcast);\n"/**\n * @license  
 * Copyright 2019 Google LLC. All  
 Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "\License");\n * you may not use this  
 file except in compliance with the License.\n * You may obtain a copy of the License at\n */
```

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```
=====\n\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n ]);\n}\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n{TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function\nidentity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\nidentityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as { } as\n KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n\n=====\n\n*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {identity} from\n './Identity';\nimport {CppType} from './types';\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,\n xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>\n void;\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*\n void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n ]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs,\n backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better\n // due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
```

```

attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n  if (perm[i] !== i) {\n    permIsNoOp = false;\n  }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n  dataId: inputs.x.dataId,\n  shape: reducedShape,\n  dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n  const cloned = identity({inputs, backend});\n  cloned.shape = outShape;\n  return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n  xId,\n  xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n  perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n  return outShape;\n}\n\nfunction removeOneSizeDims(\n  shape: number[], perm: number[]): [number[], number[]]\n{\n  const newShape: number[] = [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if (shape[i] !== 1) {\n      newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n      newPerm.push(perm[i]);\n    }\n  }\n  for (let i = 0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j = 0; j < newPerm.length; ++j) {\n      if (newPerm[j] >= i &&\n        (minValIdx === -1 || newPerm[minValIdx] >\n        newPerm[j])) {\n        minValIdx = j;\n      }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName: 'wasm',\n  kernelFunc: transpose as {} as KernelFunc,\n  setupFunc: setup,\n};\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n  x: TensorInfo,\n  axis: number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes: number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank = x.shape.length;\n\n  const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let inputWasTransposed = false;\n  if (permutedAxes !== null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i < newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n    axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n      transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n    }\n  }\n\n  return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n
```



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{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAll = backend.wasm.cwrap(All, null
/*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:
AllAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAll(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const allConfig: KernelConfig = {\n  kernelName: All,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: all as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmAny = backend.wasm.cwrap(Any,
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis,
backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input =
transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n  backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmAny(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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=====
*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { permuteAxesAndTranspose } from
 './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, outerSize:
number, innerSize: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // outer_size\n    'number', // inner_size\n    'number' // out_id\n  ]);\n\n  function argmax(\n    args:
{inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n    const {backend, inputs, attrs} = args;\n
    const {axis} = attrs as {} as ArgMaxAttrs;\n    const {x} = inputs as {} as ArgMaxInputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
      const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n      if (transposedId !== xId) {\n        // transpose
was not a no-op. We will need to dispose of this\n        // once we are done.\n        input = transposed;\n        inputId =
transposedId;\n      }\n    }\n\n    const outShape = input.shape.slice(0, -1);\n    const out =
backend.makeOutput(outShape, 'int32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const outerSize =
util.sizeFromShape(out.shape);\n    const innerSize = input.shape[axes[0]];\n    wasmFunc(inputId,
CppDType[input.dtype], outerSize, innerSize, outId);\n\n    if (inputWasTransposed) {\n      // dispose of the
transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    return out;\n  }\n\n  export const
argMaxConfig: KernelConfig = {\n    kernelName: ArgMax,\n    backendName: 'wasm',\n    kernelFunc: argmax as {}
as KernelFunc,\n    setupFunc: setup\n  };
}
\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmAvgPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, strideHeight: number,\n
strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n
    'number', // inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n
    'number', // padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n
    'number', // strideHeight\n    'number', // strideWidth\n    'number', // channels\n    'number', // outId\n  ]);\n\n  function
avgPool(\n    args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n    const {inputs, attrs,
backend} = args;\n\n    const x = inputs.x as Tensor4D;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n\n    const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n    const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n    const filterHeight =
convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft =
convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n    if (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n
`wasm backend does not support dataFormat: ` +\n        `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n
    }\n\n    if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n      throw new Error(\n
`was backend
only supports average pooling with dilation = [1, 1], ` +\n        `got [${convInfo.dilationHeight},

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    ${convInfo.dilationWidth}]);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
    outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
    filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n    outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n    kernelName: AvgPool,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: avgPool as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
    \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
    License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
    agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
    WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
    the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport { KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util } from '@tensorflow/tfjs-
core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nexport function reshape(\n    args: { inputs:
    ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm }) {\n    const { inputs, attrs } = args;\n    const { x } =
    inputs;\n    const { shape } = attrs;\n\n    const xSize = util.sizeFromShape(x.shape);\n    const $shape =
    util.inferFromImplicitShape(shape, xSize);\n\n    util.assert(\n        xSize === util.sizeFromShape($shape),\n        () =>
        `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n        `shape must have the same number of
        elements.`);\n\n    // Backend needs to track refCount for the dataId for reshape op\n    args.backend.incRef(x.dataId);\n
    return { dataId: x.dataId, shape: $shape, dtype: x.dtype };\n}\n\nexport const reshapeConfig: KernelConfig = {\n
    kernelName: Reshape,\n    backendName: 'wasm',\n    kernelFunc: reshape as { } as KernelFunc\n};\n", "/**\n *
    @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
    2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
    copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
    law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
    WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
    the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport { BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { reshape } from
    './Reshape';\n\nlet wasmBatchMatMul: (\n    aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n    bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n    transposeB: boolean, outId: number) =>
    void;\n\nfunction setup(backend: BackendWasm) {\n    wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
    null /* void */, [\n        'number', // a_id\n        'array', // a_shape\n        'number', // a_shape.length\n        'number', // b_id\n        'array', // b_shape\n        'number', // b_shape.length\n        'number', // transpose_a\n        'number', // transpose_b\n        'number' // out_id\n    ]);\n\n    function batchMatMul(args: {\n        inputs: BatchMatMulInputs,\n        backend:
        BackendWasm,\n        attrs: BatchMatMulAttrs\n    }) {\n        const { inputs, backend, attrs } = args;\n        const { a, b } = inputs;\n
        const { transposeA, transposeB } = attrs;\n\n        if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n
            throw new Error(\n                `BatchMatMul for non non-float32 tensors not yet supported.`);\n        }\n\n        const aRank = a.shape.length;\n        const
        bRank = b.shape.length;\n\n        const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n        const
        innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n        const outerShapeA = transposeA ?
        a.shape[aRank - 1] : a.shape[aRank - 2];\n        const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
        1];\n\n        const outerDimsA = a.shape.slice(0, -2);\n        const outerDimsB = b.shape.slice(0, -2);\n\n        const batchDimA =
        util.sizeFromShape(outerDimsA);\n        const batchDimB = util.sizeFromShape(outerDimsB);\n\n        const
        batchDimsCompatible =\n            batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n        util.assert(\n            aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n            () => `Error in matMul: the input
            batch dimensions must either be the ` +\n            `same or at least one input batch dimension must be 1. Got input `
            +\n            `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n        const outShapeOuterDims =\n

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HQUFHLE1BQU0sQ0FBQyxDQUFDO0tBQ3ZFO0IBRUQsTUFBTSxXQUFXLEdBQUcsS0FBSyxLQUFLFFB
QVEsQ0FBQyxDQUFDO1FBQ3BDFLIBQVksQ0FBQyxzKqFBc0IsQ0FBQyxJQUFvQixDQUFDLENBQUMsQ
0FBQztRQUMzRCxJQUFrQixDQUFDO0IBRXZCLE1BQU0sS0FBSyxHQUFHLE1BQU0sQ0FBQyxLQUFLLE
VBQUUsS0FBSyxFQUFFLFdBQVcsQ0FBQyxDQUFDO0IBQ2heLE1BQU0sTUFBTSxHQUFHLE1BQU0sQ0F
BQyxJQUFJLEVBQUUsS0FBSyxDQUFDLENBQUM7SUFDbkMsS0FBSyxJQUFJLENBQUMsR0FBRyxDQUF
DLEVBQUUsQ0FBQyxHQUFHLE1BQU0sQ0FBQyxJQUFJLEVBQUUsRUFBRsxDQUFDLEVBQUU7UUFDC
EMsTUFBTSxNQFNLEdBQUcsTUFBTSxDQUFDLFBVQVUsQ0FBQyxDQUFDLENBQUMsQ0FBQztRQUN
wQyxNQFNLEtBQUssR0FBRyxNQFNLENBQUMsR0FBRyxDQUFDLENBQUMsR0FBVyxFQUFFLENBQ
UMsRUFBRsxFQUFFLENBQUMsR0FBRyxHQUFHLEtBQUssQ0FBQyxDQUFDLENBQUMsQ0FBQyxDQUF
DO1FBQzdELE1BQU0sQ0FBQyxHQUFHLENBQUMsS0FBSyxDQUFDLEdBQUcsQ0FBQyxHQUFHLEtBQU
sQ0FBQyxFQUFFLEdBQUcsTUFBTSxDQUFDLENBQUM7S0FDNUM7SUFFRCxJQUFJLEtBQUssS0FBSyxR
QURLEVBQUU7UUFDDeIsT0FBTyxZQUFZLENBQUMsc0JBQXNCLLENBQUMsTUFBTSxDQUFDLE1BQ
WtCLENBQUMsQ0FBQztLQUN2RTtJQUNELE9BQU8sTUFBTSxDQUFDLE1BQW9CLENBQUM7QUFDckM
sQ0FBQztBQUVELE1BQU0sVUFBVsxLQUFFLENBQ2pCLEIBQXVFO0IBRXpFLE1BQU0sRUFBQyxNQF
NLEVBQUUsT0FBTyxFQUFFLEtBQUssRUFBQyxHQUFHLEIBQUksQ0FBQztJQUN0QyxNQFNLEVBQUM
sQ0FBQyxFQUFDLEdBQUcsTUFBTSxDQUFD00IBQ25CLE1BQU0sRUFBQyxLQUFFLEVBQUUsSUFBSs
FQUFDLEdBQUcsS0FBSyxDQUFDO0IBRTVCLGdCQUFnQixDQUFDLENBQUMsRUFBRsxPQUFPLENBQ
UMsQ0FBQztJQUU3QixNQFNLENBQUMsTUFBTSxQUFFLEtBQUssQ0FBQyxHQUFHLEVBVQUUsQ0FB
QyxNkqFBZ0IsQ0FBQyxDQUFDLEVBQUUsS0FBSyxFQUFFLEIBQUksQ0FBQyxDQUFDO0IBQ3BFLFBVQ
VUsQ0FBQyxPqkFBAUIsQ0FBQyxDQUFDLEVBQUUsTUFBTSxQUFFLEtBQUssQ0FBQyxDQUFDO0IBRS
9DLE1BQU0sSUFBSsxHQUFHLE9BQU8sQ0FBQyxJQUFJLENBQUMsR0FBRyxDQUFDLENBQUMsQ0FBQ
yxNQFNLENBQUMsQ0FBQyxNQFNLENBQUM7SUFDL0MsTUFBTSxPQUFPLEdBQUcsU0FBUyxDQUF
DLEIBQUksRUFBRsxNQFNLEVBQUUsS0FBSyxFQUFFLENBQUMsQ0FBQyxLQUFFLEVBQUUsQ0FBQy
xDQUFDLEtBQUssQ0FBQyxDQUFDO0IBQ2pFLE9BQU8sT0FBTyxDQUFDLGNBQWMSQ0FBQyxLQUFFLE
VBQUUsQ0FBQyxDQUFDLEtBQUssRUFBRsxPQUFPLENBQUMsQ0FBQztBQUN6RCxDQUFDO0FBRUQsT
UFBTSxDQUFDLE1BQU0sV0FBVyxHQUFpQjJQUN2QyxVQUFVLEVBQUUsS0FBSzJQUNqQixXQUFXLE
VBQUUsS0FBSzJQUNsQixVQUFVLEVBQUUsS0FBeUI7Q0FDdEMsQ0FBQyIsInNvdXJjZXND250ZW50Ijp
bli8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMTEMuIEFsbCBSaWdodHMgUm
VzZXJ2ZWQuXG4gKiBMaWNlbnNlZCB1bmRlcjB0aGUgQXBhY2hlIExpY2Vuc2UsIFZlcnNpb24gMi4wICh0a
GUgXCIjMaWNlbnNlZCB1bmRlcjB0aGUgQXBhY2hlIExpY2Vuc2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxuIC
ogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUGbGF3IG9yIGFncmVlZCB0byBpbjB3cml0aW5nLCBzb2
Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhliExpY2Vuc2UgaXMGZGlzdHJpYnV0ZWQgb24gYW4g
XCJBuYBU1wiIEBU0ITLFXuICogV0IUSE9VVCBxQVJSQU5USUVTIE9SIENPTkRjVEIPTIMgT0YgQU5Z
EtJTkQsIGVpdGhlcilBleHBZyXZNzIG9yIGltcGxpZWQuXG4gKiBTZWUgdGhliExpY2Vuc2UgZm9yIHRoZSBz
GVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybyWlzc2lvbnMgYW5kXG4gKiBsaW1pdGF0aW9ucyB1bm
RlcjB0aGUgTGltZW5zZS5cbiAqID09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT
T09PT
JhY2t1bmRlYW5kXG4gKlxuICogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUGbGF3IG9yIGFncmVlZCB0byBpbjB3cml0aW5nLCBzb2
Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhliExpY2Vuc2UgZm9yIHRoZSBzGVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybyWlzc2lvbnMgYW5kXG4gKiBsaW1pdGF0aW9ucyB1bm
RlcjB0aGUgTGltZW5zZS5cbiAqID09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT09PT
W5kVmFsdVWzLCBiZDpbjogbnVtYmVyW10sIHNPemU6IG51bWJlcltdLCBzaGFwZTogbnVtYmVyW10sXG4gI
CAGZHR5cGU6IERhdGFUeXBIKTogQmFja2VuZGFzZWhbV1cyB7XG4gIGNvbnN0IGlzQ29udGlub3VzID0gc2
xpY2VfdXRpbC5pc1NsaWNlQ29udGlub3VzKHNoYXBiLlCBiZDpbjogbnVtYmVyW10sXG4gIGNvbnN0IGxlbn
d0aCA9IHV0aWwuc216ZUZYb21TaGFwZShzaXplKTtcbiAgY29uc3QgeFN0cmklZXMgPSB1dGlzLmNvbXB1dGVtd

HJpZGVzKHNoYXBIKTtcbLxUCBpZiAoaXNDb250aW5vdXMpIHtcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc2xpY2VfdXRpbC5jb21wdXRIRmxhdE9mZnNldChiZWdpbiwgeFN0cmkZXMpO1xuXG4gICAgAgaWYgKGR0eXBIIID09PSAnc3RyaW5nJyke1xuICAgICAgcmV0dXJuICh2YWxzIGFzIFVpbnQ4QXJyYXlhbXSkuc2xpY2UoZmxhdE9mZnNldCwgZmxhdE9mZnNldCArIGxlbnmd0aCk7XG4gICAgfVxuXG4gICAgcmV0dXJuICh2YWxzIGFzIFR5cGVkQXJyYXkplN1YmFycmF5KGZsYXRPZmZzZXQsIGZsYXRPZmZzZXQgKyBsZW5ndGgpO1xuICB9XG5cbiAgY29uc3QgZGVjb2RIZERhdGEgPSBkdHlwZSA9PT0gJ3N0cmLuZycgP1xuICAgICAgYmFja2VuZf91dGlsLmZyb21VaW50OFRvU3RyaW5nQXJyYXkodmFscYBhcyBvaW50OEFycmF5W10pIDpbiAgICAgIHZhbHMgYXMGVHlwZWRBcnJheTtcbLxUCBjb25zdCBpbk1JiA9IGJ1ZmZlcihzaGFwZSwgZHR5cGUsIGRlY29kZWREYXRhKTtcbiAgY29uc3Qgb3V0QnVmID0gYnVmZmVyKHNpemUsIGR0eXBIIKTtcbiAgZm9yIChsZXQgaSA9IDA7IGkgPCBvdXRcdWYuc2l6ZTsgKypKSB7XG4gICAgY29uc3Qgb3V0TG9jID0gb3V0QnVmLmluZGV4Vg9Mb2MoaSk7XG4gICAgY29uc3QgaW5Mb2MgPSBvdXRmb2MubWFWKChpZHG6IG51bWJlciwgaikgPT4gaWR4ICsgYmVnaW5bal0pO1xuICAgICAgIG91dEJ1Zi5zZXQoaW5CdWYuZ2V0KC4uLmluTG9jKSwgLi4ub3V0TG9jKTtcbiAgfVxuXG4gIGlmlChkdHlwZSA9PT0gJ3N0cmLuZycpIHtcbiAgICBjZXR1cm4gYmFja2VuZf91dGlsLmZyb21TdHJpbmdBcnJheVRvVWludDgob3V0QnVmLnZhbHVlcyBhcyBzdHJpbmdbXSk7XG4gIH1cbiAgcmV0dXJuIG91dEJ1Zi52YWx1ZXMgYXMGVHlwZWRBcnJheTtcbn1cbLxUXhwb3J0IGZ1bmN0aW9uIHNSaWNlKfXUICAgIGFyZ3M6IHtpbnB1dHM6IFNSaWNlSW5wdXRzLCBiYWNrZW5kOiBNYXR0cmFja2VuZENQVSwgYXR0cnM6IFNSaWNlQXR0cnN9KTpbiAgICBUZSW5zb3JjbmZvIHtcbiAgY29uc3Qge2lucHV0cywgYmFja2VuZCwgYXR0cnN9ID0gYXJncztcbiAgY29uc3Qge3h9ID0gaW5wdXRzO1xuICBj25zdCB7YmVnaW4sIHNSpemV9ID0gYXR0cnM7XG5cbiAgYXNzZXJ0Tm90Q29tcGxleCh4LCAnc2xpY2UnKTtcbLxUCBjb25zdCBbJGJlZ2luLCAkc2l6ZV0gPSBzbGljZV91dGlsLnBhcnNIU2xpY2VQYXJhbXMOeCwgYmVnaW4sIHNSpemUpO1xuICBzbGljZV91dGlsLmFzc2VydFBhcmFtc1ZhbGlkKHgsICRiZWdpbiwgJHNpemUpO1xuXG4gIGNvbnN0IHZhbHMgPSBiYWNRZW5kLmRhdGEuZ2V0KHguZGF0YUlkKS52YWx1ZXM7XG4gIGNvbnN0IG91dFZhbHMgPSBzbGljZUlteGwodmFscywGJlZ2luLCAkc2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNrZW5kLm1ha2VUZSW5zb3JjbmZvKCRzaXplLCB4LmR0eXBILCBvdXRWYWxzKTtcbn1cbLxUXhwb3J0IGNvbnN0IHNSaWNlQ29uZmlnOiBLZXJuzWxDb25maWcgPSB7XG4gIGtcm5lbE5hbWU6IFNSaWNlFxuICBiYWNrZW5kTmFtZTogJ2NwdScsXG4gIGtcm5lbEZ1bmM6IHNSaWNlIGFzIHt9IGFzIEtcm5lbEZ1bmNcbn07XG4iXX0=","/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {sliceImplCPU} from './kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n  const isContinuous = slice_util.isSliceContinuous(x.shape, begin_, size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinuous) {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n        (xVals as Uint8Array[]).slice(flatOffset, flatOffset +\n          util.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n      outVals.set(\n        (xVals as TypedArray).subarray(flatOffset, flatOffset +\n          util.sizeFromShape(size_)));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2) {\n    slice2d(\n      xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n      size_ as
```

```

[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n
}\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport
{ reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =
backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n
attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n

```



```

=====
*/
import { backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util } from
'@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
import { concatImplCPU } from
'./kernel_utils/shared';
import { identity } from './Identity';
import { reshape } from './Reshape';
export function
concat(
  args: { inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs } ) {
  const { inputs, backend }
= args;
  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];
  let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);
  // Keep only non-empty tensors (ignore tensors
with 0 in their shape).
  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);
  if ($inputs.length ===
1) {
    return identity({ inputs: { x: $inputs[0] }, backend });
  }
  const out = backend.makeOutput(outShape,
inputs[0].dtype);
  if (util.sizeFromShape(outShape) === 0) {
    return out;
  }
  const shapes =
$inputs.map(t => t.shape);
  backend_util.assertParamsConsistent(shapes, axis);
  if ($inputs[0].dtype ===
'string') {
    // Any concat of n-dimensional tensors across any axis can be reduced to
    // a concatenation of two-
dimensional tensors across the axis 1 by first
    // partitioning the axes of the original tensors into those less than
the
    // axis to be concatenated and the rest. Then reshape the tensors
    // into a two-dimensional tensor by
collapsing these two sets of axes and
    // concatenate the resulting matrices across the axis 1, finally reshaping
    // the result to have the proper shape.
    const inputs2D = $inputs.map(t => {
      const innerSize =
util.sizeFromShape(t.shape.slice(axis));
      const shape = [-1, innerSize];
      return reshape({ inputs: { x: t },
backend, attrs: { shape } });
    });
    const inputsValShapes = inputs2D.map(t => {
      return { vals:
backend.readSync(t.dataId), shape: t.shape };
    });
    // Concat 2d tensors along axis=1.
    outShape =
backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);
    const simplyConcat =
inputs2D[0].shape[0] === 1;
    const outVals = concatImplCPU(
      inputsValShapes, outShape,
inputs[0].dtype,
      simplyConcat) as string[];
    const finalOutShape =
backend_util.computeOutShape($inputs.map(t => t.shape), axis);
    out.shape = finalOutShape;
    const
outData = backend.dataIdMap.get(out.dataId);
    outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);
    inputs2D.forEach(t => backend.disposeData(t.dataId));
    return out;
  }
  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));
  let sumInnerDims =
0;
  const innerDims = $inputs.map(input => {
    const innerDim = util.sizeFromShape(input.shape.slice(axis));
    sumInnerDims += innerDim;
    return innerDim;
  });
  const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));
  const outVals = backend.typedArrayFromHeap(out);
  for (let b = 0; b <
batchDim; b++) {
    let outOffset = b * sumInnerDims;
    for (let i = 0; i < inVals.length; i++) {
      const
innerDim = innerDims[i];
      const inOffset = b * innerDim;
      const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);
      outVals.set(vals, outOffset);
      outOffset += innerDim;
    }
  }
  return
out;
}
export const concatConfig: KernelConfig = {
  kernelName: Concat,
  backendName: 'wasm',
  kernelFunc: concat as { } as KernelFunc;
};
/*
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 * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language
governing permissions and
 * limitations under the License.
 */
=====
*/
import { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from
'@tensorflow/tfjs-core';
import { BackendWasm } from './backend_wasm';
let wasmConv2d: (
  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,
  filterId: number, filterHeight: number,
filterWidth: number, padTop: number,
  padRight: number, padBottom: number, padLeft: number, isSamePad:
number,
  dilationHeight: number, dilationWidth: number, strideHeight: number,
  strideWidth: number,
inputChannels: number, outputChannels: number,
  outId: number) => void;
function setup(backend:
BackendWasm) {
  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [
    'number', // xId

```

```

'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number',
// filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', //
padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', //
dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number',
// outputChannels\n 'number', // outId\n ]);\n\nfunction conv2d(\n  args: {inputs: Conv2DInputs, backend:
BackendWasm, attrs: Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n    pad, dimRoundingMode, false,
$dataFormat);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const
padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom =
convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type
=== 'SAME' ? 1 : 0;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm backend
Conv2D does not support dataFormat:` +\n      ` ${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n    xId, x.shape[0], x.shape[1], x.shape[2], filterId,
filterHeight,\n    filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n    dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n    outputChannels, outId);\n  return out;\n}\n\nexport
const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: conv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'./backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n  dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n  filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n  strideHeight: number, strideWidth: number,
topPad: number, leftPad: number,\n  fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
xRowStride: number, xColStride: number, xChannelStride: number,\n  yBatchStride: number, yRowStride:
number, yColStride: number,\n  yChannelStride: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n
'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', //
filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', //
outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', //
strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number',
// fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', //
xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number',
// yChannelStride\n 'number', // outId\n ]);\n\nfunction conv2DBackpropInput(args: {\n  backend:
BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n

```

```

const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat,\n dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat =\n backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode,\n false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } =\n convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 -\n convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides =\n util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1,\n fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride =\n isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const\n xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride =\n isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const\n yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape,\n 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId =\n backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2,\n xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:\n conv2DBackpropInput as {} as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
  
  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *====*\n\n *\n *\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *  
  
  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *====*\n\n *\n *\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *  
  
  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *====*\n\n *\n *\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,

```

```

TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {cast}
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n  bilinear = 0,\n  nearest
= 1\n}\n\nlet wasmCropAndResize: (\n  imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n  imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n  method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
  wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n    'number', // imagesId\n
    'number', // boxesId\n    'number', // boxIndId\n    'number', // numBoxes\n    'array', // images shape\n
    'number', // cropHeight\n    'number', // cropWidth\n    'number', // method\n    'number', // extrapolation value\n
    'number' // out id\n  ]);\n\n  function cropAndResize(args: {\n    backend: BackendWasm,\n    inputs: CropAndResizeInputs,\n
    attrs: CropAndResizeAttrs\n  }): TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {method,
    extrapolationValue, cropSize} = attrs;\n    const {image, boxes, boxInd} = inputs;\n    const numBoxes =
    boxes.shape[0];\n    const [cropHeight, cropWidth] = cropSize as [number, number];\n    const outShape =
    [numBoxes, cropHeight, cropWidth, image.shape[3]];\n    let imagesData =
    backend.dataIdMap.get(image.dataId);\n    let castedData;\n    if (image.dtype !== 'float32') {\n      castedData =
    cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n      imagesData =
    backend.dataIdMap.get(castedData.dataId);\n    }\n    const imagesId = imagesData.id;\n    const boxesId =
    backend.dataIdMap.get(boxes.dataId).id;\n    const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n    const
    out = backend.makeOutput(outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const
    imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n    wasmCropAndResize(\n
    imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n    cropWidth,\n
    InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n    extrapolationValue, outId);\n    if
    (castedData !== null) {\n      backend.disposeData(castedData.dataId);\n    }\n    return out;\n  }\n\n  export const
    cropAndResizeConfig: KernelConfig = {\n    kernelName: CropAndResize,\n    backendName: 'wasm',\n    setupFunc:
    setup,\n    kernelFunc: cropAndResize as {} as KernelFunc\n  };
  }\n\n  /**\n   * @license\n   * Copyright 2020 Google
  LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not
  use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   *
  http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   *
  software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES
  OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language
  governing permissions and\n   * limitations under the License.\n   */
  }\n\n  =====\n\n  *\n\n  import {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
  from '@tensorflow/tfjs-core';\n\n  import {BackendWasm} from './backend_wasm';\n\n  import {CppType} from
  './types';\n\n  import {transpose} from './Transpose';\n\n  let wasmCumsum: (xId: number, exclusive: number, reverse:
  number,\n    finalDim: number, outId: number, dtype: CCppType) => void;\n\n  function setup(backend:
  BackendWasm) {\n    wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n      'number', // x_id\n
      'number', // exclusive\n      'number', // reverse\n      'number', // final_dim\n      'number', // out_id\n
      'number' // dtype\n    ]);\n\n    export function cumsum(\n      args: {inputs: CumsumInputs, backend: BackendWasm,
      attrs: CumsumAttrs\n    }): TensorInfo {\n      const {inputs, backend, attrs} = args;\n      const {x} =
      inputs;\n      const {axis, exclusive, reverse} = attrs;\n      const xRank = x.shape.length;\n      util.assert(x.dtype === 'float32' || x.dtype ===
      'int32',\n        () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n      // permute
      required axis\n      to inner most axis\n      const permutation = backend_util.getAxesPermutation([axis], xRank);\n      let permutedX = x;\n      if
      (permutation !== null) {\n        permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n      }\n      const
      permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n      backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n      const permutedOut =
      backend.makeOutput(permutedX.shape, permutedX.dtype);\n      const finalDim = permutedX.shape[permutedAxis];\n      const
      permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n      const permutedOutId =
      backend.dataIdMap.get(permutedOut.dataId).id;\n      wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,

```

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finalDim,\n      permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n   const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n     {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n   backend.disposeData(permutedX.dataId);\n
backend.disposeData(permutedOut.dataId);\n } \n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n  xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n  xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n  outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number', // xId\n    'number', // blockSize\n    'number', // channelsLast\n    'array', // xStrides\n
'number', // xStridesLength\n    'array', // outputShape\n    'array', // outputStrides\n    'number', // outSize\n
'number', // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs:
DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const
outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth =
inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n    [batchSize,
outputHeight, outputWidth, outputDepth] :\n    [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const
out = backend.makeOutput(outputShape, 'float32');\n\n  const xData = backend.dataIdMap.get(x.dataId);\n  const
xId = xData.id;\n  const xStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n  const outStridesBytes =\n    new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n    xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n    outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as { } as KernelFunc\n};\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n  xId: number, batchSize: number,

```



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inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:\n number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:\n number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number,\n outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n    backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n      'number', //\n      xId\n      'number', // batchSize\n      'number', // inputHeight\n      'number', // inputWidth\n      'number', //\n      filterId\n      'number', // filterHeight\n      'number', // filterWidth\n      'number', // padTop\n      'number', //\n      padRight\n      'number', // padBottom\n      'number', // padLeft\n      'number', // isSamePad\n      'number', //\n      dilationHeight\n      'number', // dilationWidth\n      'number', // strideHeight\n      'number', // strideWidth\n      'number', // inputChannels\n      'number', // outputChannels\n      'number', // outId\n    ]);\n\n  function\n  depthwiseConv2d(args: {\n    inputs: DepthwiseConv2dNativeInputs,\n    backend: BackendWasm,\n    attrs:\n      DepthwiseConv2dNativeAttrs\n  }) {\n    const {inputs, attrs, backend} = args;\n\n    const {x, filter} = inputs;\n\n    const\n    xId = backend.dataIdMap.get(x.dataId).id;\n    const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n    const\n    {strides, dilations, pad, dimRoundingMode} = attrs;\n\n    const $dilations = dilations === null ? [1, 1] : dilations;\n\n    const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape,\n      strides,\n      ($dilations as number | [number, number]), pad, dimRoundingMode,\n      true /* depthwise */);\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const padTop =\n      convInfo.padInfo.top;\n    const padRight = convInfo.padInfo.right;\n    const padBottom = convInfo.padInfo.bottom;\n    const padLeft = convInfo.padInfo.left;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =\n      convInfo.dilationWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =\n      convInfo.strideWidth;\n    const inputChannels = convInfo.inChannels;\n    const outputChannels =\n      convInfo.outChannels;\n    const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n    if\n    (convInfo.dataFormat !== 'channelsLast') {\n      throw new Error(\n        `wasm backend DepthwiseConv2dNative\n        does not support dataFormat: ` +\n        `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n    }\n\n    const out =\n      backend.makeOutput(convInfo.outShape, 'float32');\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    wasmDepthwiseConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth,\n      padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth, strideHeight, strideWidth,\n      inputChannels,\n      outputChannels, outId);\n\n    return out;\n  }\n\n  export const depthwiseConv2dNativeConfig:\n  KernelConfig = {\n    kernelName: DepthwiseConv2dNative,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: depthwiseConv2d as {} as KernelFunc\n  };;\n\n  /**\n   * @license\n   * Copyright 2021 Google LLC. All\n   * Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you may not use this\n   * file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * \n   * http://www.apache.org/licenses/LICENSE-2.0\n   * \n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language\n   * governing permissions and\n   * limitations under the License.\n   */\n  =====\n\n  *\n  import {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n  import {createUnaryKernelConfig} from\n  './unary_kernel';\n\n  export const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n  /**\n   * @license\n   * Copyright 2020 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the\n   * "License");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the\n   * License at\n   * \n   * http://www.apache.org/licenses/LICENSE-2.0\n   * \n   * Unless required by applicable law or\n   * agreed to in writing, software\n   * distributed under the License is distributed on an "AS IS" BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for\n   * the specific language governing permissions and\n   * limitations under the License.\n   */\n  =====\n\n  *\n  import {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n  import {createBinaryKernelConfig} from\n  './binary_kernel';\n\n  const supportsFullBroadcast = false;\n  export const equalConfig: KernelConfig =\n
```

createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nexport function expandDims(args: {\n  inputs: ExpandDimsInputs,\n  attrs: ExpandDimsAttrs,\n  backend: BackendWasm\n}) {\n  const {inputs, attrs, backend} = args;\n  const {input} = inputs;\n  const {dim} = attrs;\n  const inputRank = input.shape.length;\n  const newShape = input.shape.slice();\n  let $dim = dim;\n  if (dim < 0) {\n    // Negative value is counted from the tail of rank.\n    util.assert(\n      -(inputRank + 1) <= dim,\n      () => `Axis must be in the interval [${-(inputRank + 1)}, ${inputRank}]`);\n    $dim = inputRank + dim + 1;\n  }\n  newShape.splice($dim, 0, 1);\n  return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\nexport const expandDimsConfig: KernelConfig = {\n  kernelName: ExpandDims,\n  backendName: 'wasm',\n  kernelFunc: expandDims as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n  const {attrs: {shape, value, dtype}, backend} = args;\n  const out = backend.makeOutput(shape, dtype);\n  const outVals = backendtypedArrayFromHeap(out);\n  outVals.fill(value as number);\n  return out;\n}\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'wasm',\n  kernelFunc: fill as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
```

```

core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n  xId: number, batch:
number, imageHeight: number, imageWidth: number,\n  numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', //
imageWidth\n    'number', // numChannels\n    'number', // outId\n  ]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n  const {inputs, backend} = args;\n
const {image} = inputs;\n  const out = backend.makeOutput(image.shape, image.dtype);\n  const imageId =
backend.dataIdMap.get(image.dataId).id;\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const [batch,
imageHeight, imageWidth, numChannels] = image.shape;\n\n  wasmFlipLeftRight(\n    imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n  return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'wasm',\n  kernelFunc: flipLeftRight as { } as
KernelFunc,\n  setupFunc: setup\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n\n",/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const floorDivConfig: KernelConfig =\ncreateBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n\n",/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet
wasmBatchNorm: (\n  xId: number, meanId: number, varianceId: number, offsetId: number,\n  scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
  wasmBatchNorm = backend.wasm.cwrap(\n    FusedBatchNorm, null /* void */,\n    ['number', 'number',
'number', 'number', 'number', 'number', 'number'];\n  )\n}\n\nfunction fusedBatchNorm(args: {\n  backend:
BackendWasm,\n  inputs: FusedBatchNormInputs,\n  attrs: FusedBatchNormAttrs\n}): TensorInfo {\n  const
{backend, inputs, attrs} = args;\n  const {varianceEpsilon} = attrs;\n  const {x, mean, variance, offset, scale} =
inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const meanId =
backend.dataIdMap.get(mean.dataId).id;\n  const varianceId = backend.dataIdMap.get(variance.dataId).id;\n  const

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offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as { } as
KernelFunc\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

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=====\n
*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,
padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,
dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\n\nfunction
fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n
FusableActivation[activation as { } as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw
new Error(\n ` ${activation} activation not yet supported for FusedConv2D ` +\n ` in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if
(bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n
throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank
${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n
`FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels
(${outputChannels}).`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const
filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight =
convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const
strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =

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convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support
dataFormat:` +\n `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation,
preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:
number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //
padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n
'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\n}\n\nfunction
fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:
FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,
preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {}
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation}
activation not yet supported for FusedDepthwiseConv2D`\n +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got`\n +\n `rank ${biasData.shape.length}.`);\n }\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not`\n +\n `match the number of output channels (${outputChannels}).`);\n }\n

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biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n   throw new Error(\n     `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n     `${dataFormat}`. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n   xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n   biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n   dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n   fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName: FusedDepthwiseConv2D,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n", "/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet
wasmGatherNd: (\n  xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n  sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n    'number', // xId\n
'number', // dtype\n    'number', // indicesId\n    'number', // numSlices\n    'number', // sliceRank\n
'number', // sliceSize\n    'array', // strides\n    'number' // outId\n  ]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n  TensorInfo {\n  const {backend, inputs} = args;\n  const {params, indices} =
inputs;\n\n  const [resultShape, numSlices, sliceSize, strides] =\n    gather_util.prepareAndValidate(params,
indices);\n\n  const out = backend.makeOutput(resultShape, params.dtype);\n  if (numSlices === 0) {\n    return
out;\n  }\n\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n\n  const xData = backend.dataIdMap.get(params.dataId);\n  const xId = xData.id;\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmGatherNd(\n    xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n    stridesBytes,
outId);\n\n  return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherNd\n};\n", "/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n

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*\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,
TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {reshape} from './Reshape';\n\nimport {CppType} from './types';\n\nlet wasmGather:
(\n  xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n  indicesId: number, batchSize:
number, outStrides: Uint8Array,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
waswGather = backend.wasm.cwrap('Gather', null /*void*/, [\n  'number', // xId\n  'number', // dtype\n  'array',
// xStrides\n  'number', // stridesSize\n  'number', // indicesId\n  'number', // batchSize\n  'array', //
outStrides\n  'number' // outId\n ]);\n\nfunction gatherV2(\n  args: {backend: BackendWasm, inputs:
GatherV2Inputs, attrs: GatherV2Attrs}): \n  TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x,
indices} = inputs;\n  const {axis, batchDims} = attrs;\n\n  // Throw error when any index is out of bound.\n  const
parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const indicesVals = backend.readSync(indices.dataId) as
TypedArray;\n  const axisDim = x.shape[parsedAxis];\n  for (let i = 0; i < indicesVals.length; ++i) {\n  const index
= indicesVals[i];\n  util.assert(\n    index <= axisDim - 1 && index >= 0,\n    () =>\n    `GatherV2: the
index value ${index} is not in [0, ${axisDim - 1}]);\n  }\n\n  const shapeInfo =
backend_util.segment_util.collectGatherOpShapeInfo(\n    x as Tensor, indices as Tensor, parsedAxis,
batchDims);\n\n  const flattenX = reshape({\n    inputs: {x},\n    attrs: {\n      shape: [\n        shapeInfo.batchSize,
shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    },\n    backend\n  });\n  const
indicesSize = util.sizeFromShape(indices.shape);\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    attrs:
{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n    backend\n  });\n  const flattenOutputShape =
[\n    shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n    shapeInfo.sliceSize\n ];\n\n
const out = backend.makeOutput(flattenOutputShape, x.dtype);\n  if (util.sizeFromShape(x.shape) === 0) {\n
return out;\n  }\n  const stridesSize = flattenX.shape.length - 1;\n  const xData =
backend.dataIdMap.get(flattenX.dataId);\n  const xId = xData.id;\n\n  const indicesData =
backend.dataIdMap.get(flattenIndex.dataId);\n  const indicesId = indicesData.id;\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const xStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenX.shape)).buffer);\n  const outStridesBytes = new Uint8Array(\n    new
Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n  wasmGather(\n    xId, CppDType[x.dtype],
xStridesBytes, stridesSize, indicesId,\n    shapeInfo.batchSize, outStridesBytes, outId);\n\n  backend.disposeData(flattenX.dataId);\n  backend.disposeData(flattenIndex.dataId);\n\n  // reshape\n  out.shape =
shapeInfo.outputShape;\n  return out;\n  }\n\nexport const gatherV2Config: KernelConfig = {\n  kernelName:
GatherV2,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", /**\n
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const greaterConfig: KernelConfig =\n  createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n\n", /**\n
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LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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```

```

*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig}
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n  createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from
 './types';\n\nlet wasmFunc: (\n  xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(LeakyRelu,
  null /* void */, [\n    'number', // x_id\n    'number', // dtype\n    'number', // leakyrelu_alpha\n    'number', //
  out_id\n  ]);\n\n  export function leakyRelu(\n    args: {\n      inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
  backend: BackendWasm});\n  TensorInfo {\n    const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n    const xId =
  backend.dataIdMap.get(x.dataId).id;\n    // According to TF API, LeakyRelu returns float32 when input is either
  float32\n    // or int32.\n    const out = backend.makeOutput(x.shape, 'float32');\n\n    if (util.sizeFromShape(x.shape)
  !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n      wasmFunc(xId, CppDType[x.dtype], alpha,
  outId);\n    }\n\n    return out;\n  }\n\n  export const leakyReluConfig: KernelConfig = {\n    kernelName: LeakyRelu,\n
  backendName: 'wasm',\n    setupFunc,\n    kernelFunc: leakyRelu as {} as KernelFunc,\n  }; \n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n  createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n  createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n", "/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\ncreateBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n", "/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmMax: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number', // x_id\n
'number', // dtype\n    'number', // reduce_size\n    'number', // out_id\n  ]);\n\n  function max(args: {backend:
BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n    TensorInfo {\n    const {backend, inputs, attrs} = args;\n
const {reductionIndices: axis, keepDims} = attrs;\n    const {x} = inputs;\n    const xId =
backend.dataIdMap.get(x.dataId).id;\n    let inputId = xId;\n    let input = x;\n\n    const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n    if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId =
transposedId;\n    }\n\n    const inputRank = input.shape.length;\n    backend_util.assertAxesAreInnerMostDims('max',
axes, inputRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n    const reduceSize =
util.sizeFromShape(reduceShape);\n\n    const out = backend.makeOutput(outShape, x.dtype);\n    if
(util.sizeFromShape(input.shape) !== 0) {\n      const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMax(inputId, CCppType[x.dtype], reduceSize, outId);\n    }\n\n    if (inputWasTransposed) {\n      // dispose of the
transposed tensor.\n      backend.disposeData(transposed.dataId);\n    }\n\n    if (keepDims) {\n      // reshape\n
const\n      newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n      out.shape = newShape;\n    }\n\n
return out;\n  }\n\n  export const maxConfig: KernelConfig = {\n    kernelName: Max,\n    backendName: 'wasm',\n
setupFunc: setup,\n    kernelFunc: max as {} as KernelFunc\n  };\n  "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the 'License');\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n  xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n  filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n  padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n  inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n    'number', // xId\n    'number', // batchSize\n    'number', //
inputHeight\n    'number', // inputWidth\n    'number', // filterHeight\n    'number', // filterWidth\n    'number', //
padTop\n    'number', // padRight\n    'number', // padBottom\n    'number', // padLeft\n    'number', //
dilationHeight\n    'number', // dilationWidth\n    'number', // strideHeight\n    'number', // strideWidth\n    'number', //
inputChannels\n    'number', // outputChannels\n    'number', // outId\n  ]);\n}\n\nfunction maxPool(\n  args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n  const {inputs, attrs, backend} =
args;\n\n  const x = inputs.x as Tensor4D;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n\n  // TF API
supports int32 input. CPU and WebGL backend also support int32\n  // input. WASM backend doesn't support it
because it uses xnpack which only\n  // supports float32.\n  // Add the following assert only for the WASM
backend instead of at core op\n  // level.\n  // TODO: add support for int32 input.\n  util.assert(\n    x.dtype
=== 'float32',\n    () =>\n      `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n      `wasm
backend does not support dataFormat: ` +\n      `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmMaxPool(\n    xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n    padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n
strideHeight, strideWidth, inputChannels, outputChannels, outId);\n  return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n  kernelName: MaxPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: maxPool
as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport { cast } from './Cast';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMean =\n  backend.wasm.cwrap(Mean, null /*void*/, [number, number, number]);\n}\n\nexport function mean(\n  args:
{ backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs }):\n  TensorInfo {\n  const { backend, inputs,
attrs } = args;\n  const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes,
inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId
!== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input =
transposed;\n      inputId = transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n    }\n  }\n  backend_util.assertAxesAreInnerMostDims(\n  'mean',
reductionAxes, input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput =\n    cast({ backend, inputs: { x: input }, attrs: { dtype: 'float32' }});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n  }\n\n  const out = backend.makeOutput(outShape, 'float32');\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmMean(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed
tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  if (input.dtype
!== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n\n  return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: mean as { }\n  as KernelFunc\n};\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport { backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n  void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n  'number', // x_id\n
'number', // dtype\n  'number', // reduce_size\n  'number', // out_id\n  ]);\n}\n\nfunction min(args: { backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs }):\n  TensorInfo {\n  const { backend, inputs, attrs } = args;\n
const { axis, keepDims } = attrs;\n  const { x } = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let
inputId = xId;\n  let input = x;\n\n  const { transposed, axes, originalAxes, inputWasTransposed } =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We
will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n  }\n\n  const inputRank = input.shape.length;\n\n  backend_util.assertAxesAreInnerMostDims('min', axes,
inputRank);\n  const [outShape, reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape,
axes);\n  const reduceSize = util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape,

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input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if
(inputWasTransposed) {\n  // dispose of the transposed tensor.\n  backend.disposeData(transposed.dataId);\n
}\n\n if (keepDims) {\n  // reshape\n  const newShape = backend_util.expandShapeToKeepDim(out.shape,
originalAxes);\n  out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n
kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\ncreateBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/**\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n  prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n  outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-
paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n ]);\n}\n\nfunction
mirrorPad(args: {\n  inputs: MirrorPadInputs,\n  backend: BackendWasm,\n  attrs: MirrorPadAttrs\n}) {\n  const
{inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n  const outShape = paddings.map(\n    (p, i) => p[0] /*
beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out =
backend.makeOutput(outShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat =
paddings.map(padTuple => padTuple[0]);\n  const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n    new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const
postPaddingsBytes =\n    new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n  wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n    postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n  return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc:
setup\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n  createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { BackendWasm } from './backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`\ninterface Result {\n  pSelectedIndices: number;\n  selectedSize: number;\n  pSelectedScores: number;\n  pValidOutputs: number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n  backend: BackendWasm, resOffset: number): Result {\n  const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n  const pSelectedIndices = result[0];\n  const selectedSize = result[1];\n  const pSelectedScores = result[2];\n  const pValidOutputs = result[3];\n  // Since the result was allocated on the heap, we have to delete it.\n  backend.wasm._free(resOffset);\n  return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n  boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(\n    NonMaxSuppressionV3,\n    'number', // Result*\n    [\n      'number', // boxesId\n      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', // scoreThreshold\n    ]);\n}\n\nfunction kernelFunc(args: {\n  backend: BackendWasm,\n  inputs: NonMaxSuppressionV3Inputs,\n  attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n  const {boxes, scores} = inputs;\n  const boxesId =
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backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset =\n  wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n  parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor
=\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as { } as
KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV4,\n    'number', // Result*\n    [\n      'number', // boxesId\n
      'number', // scoresId\n      'number', // maxOutputSize\n      'number', // iouThreshold\n      'number', //
scoreThreshold\n      'bool', // padToMaxOutputSize\n    ]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n  inputs: NonMaxSuppressionV4Inputs,\n  attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n    attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n  const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const
resOffset = wasmFunc(\n    boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n    padToMaxOutputSize);\n\n  const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n  // Since we are not using scores for V4, we have to delete it from the
heap.\n  backend.wasm._free(pSelectedScores);\n\n  const selectedIndicesTensor =\n  backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n  const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n  return [selectedIndicesTensor,
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as { }
as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport { KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from
'./backend_wasm';\n\nimport { parseResultStruct } from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n  iouThreshold: number, scoreThreshold: number,

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softNmsSigma: number) =>\n    number;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc =
backend.wasm.cwrap(\n    NonMaxSuppressionV5,\n    'number', // Result*\n    [\n    'number', // boxesId\n    'number', // scoresId\n    'number', // maxOutputSize\n    'number', // iouThreshold\n    'number', //
scoreThreshold\n    'number', // softNmsSigma\n    ]);\n}\n\nfunction kernelFunc(args: {\n  backend:
BackendWasm,\n  inputs: NonMaxSuppressionV5Inputs,\n  attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[]
{\n  const {backend, inputs, attrs} = args;\n  const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
= attrs;\n  const {boxes, scores} = inputs;\n\n  const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n  const
scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n  const resOffset = wasmFunc(\n    boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold,\n    softNmsSigma);\n\n  const {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs} =\n    parseResultStruct(backend, resOffset);\n\n  // Since we are not using
validOutputs for V5, we have to delete it from the\n  // heap.\n  backend.wasm._free(pValidOutputs);\n\n  const
selectedIndicesTensor =\n    backend.makeOutput([selectedSize, 'int32', pSelectedIndices);\n  const
selectedScoresTensor =\n    backend.makeOutput([selectedSize, 'float32', pSelectedScores);\n\n  return
[selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig =
{\n  kernelName: NonMaxSuppressionV5,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: kernelFunc
as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\ncreateBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nlet wasmOneHot: (\n  indicesId: number, depth:
number, onValue: number, offValue: number,\n  outId: number) => void;\nfunction setup(backend:
BackendWasm) {\n  wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n    'number', // indices_id\n
'number', // depth,\n    'number', // onValue\n    'number', // offValue\n    'number' // out_id\n  ]);\n}\n\nfunction
oneHot(\n  args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n  const {inputs,
backend, attrs} = args;\n  const {indices} = inputs;\n  const {depth, onValue, offValue} = attrs;\n\n  const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const indicesData = backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n
wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n  return out;\n}\n\nexport const oneHotConfig:
KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: oneHot as
{ } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

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on an "AS IS" BASIS, * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. * See the License for the specific language governing permissions and * limitations under the License. *

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*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport\n{BackendWasm} from './backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:\nBackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backend.toArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const\nonesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as\n  {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-\ncore';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {concat} from './Concat';\n\nimport\n{expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend:\n  BackendWasm, attrs: PackAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {axis} =\n    attrs;\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim:\n        axis}});\n    }\n\n    const shape = inputs[0].shape;\n    const dtype = inputs[0].dtype;\n\n    inputs.forEach(t => {\n      util.assertShapesMatch(\n        shape, t.shape,\n        'All tensors passed to stack must have matching shapes');\n      util.assert(\n        dtype === t.dtype,\n        () => 'All tensors passed to stack must have matching dtypes');\n    });\n\n    const intermediateTensorInfos: TensorInfo[] = [];\n    const expandedTensors = inputs.map(t => {\n      const\n      expandedT =\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n      intermediateTensorInfos.push(expandedT);\n      return expandedT;\n    });\n\n    const result = concat({inputs:\n    expandedTensors, backend, attrs: {axis}});\n\n    intermediateTensorInfos.forEach(t =>\n    backend.disposeData(t.dataId));\n\n    return result;\n  }\n\nexport const packConfig: KernelConfig = {\n  kernelName:\n  Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright\n * 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-\ncore';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}\nfrom './types';\n\nlet wasmPadV2: (\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:\n  number,\n  prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n  constantValue: number, outId:\n  number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPadV2 = backend.wasm.cwrap(PadV2, null\n  /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number', // x.shape.length\n    'number', // x.dtype\n    'array', // pre-paddings\n    'array', // post-paddings\n    'number', // constantValue\n    'number', // outId\n  ]);\n}\n\nfunction pad(\n  args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const\n  {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n  const outShape = paddings.map((p, i) =>\n  p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-
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circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n
return fill({\n  backend,\n  attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const
xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const
outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n
new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n  xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes, \n  postPaddingsBytes, constantValue, outId);\n return out;\n }\n\n\nexport
const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'wasm',\n  kernelFunc: pad as {} as
KernelFunc,\n  setupFunc: setup\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n    'number', // x_id\n    'number', // weights_id\n    'number' //
out_id\n  ]);\n\n  function prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n    const {inputs, backend}
= args;\n    const {x, alpha} = inputs;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n    let inputId = xId;\n    const input = x;\n    let castedInput = input;\n    if
(input.dtype !== 'float32') {\n      castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n      inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n    }\n\n    const out = backend.makeOutput(x.shape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmPrelu(inputId, weightsId, outId);\n\n    if (input.dtype
!== 'float32') {\n      backend.disposeData(castedInput.dataId);\n    }\n\n    return out;\n  }\n\n  export const preluConfig:
KernelConfig = {\n    kernelName: Prelu,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: prelu as {} as
KernelFunc\n  }; \n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n

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```

*\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n  dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n  'number',\n  'number',\n  'number',\n  'number'\n  ]);\n}\n\nfunction prod(args: {\n  backend: BackendWasm,\n  inputs: ProdInputs,\n  attrs:
ProdAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x}
= inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const
{transposed, axes, originalAxes, inputWasTransposed} =\n    permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We
will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length, input.shape.length);\n    }\n  }\n\n  backend_util.assertAxesAreInnerMostDims(\n    'prod', reductionAxes, input.shape.length);\n  const [outShape,
reduceShape] =\n    backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize
= util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmProd(inputId, reduceSize, CppType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const prodConfig: KernelConfig = {\n  kernelName: Prod,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: prod as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {rangeImplCPU} from './kernel_utils/shared';\n\nexport const
range =\n  (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n    const {backend, attrs} =
args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step, dtype);\n\n    const out = backend.makeOutput([values.length], dtype);\n    const outVals =
backendtypedArrayFromHeap(out);\n    outVals.set(values);\n    return out;\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'wasm',\n  kernelFunc: range as { } as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n  createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC.
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,\n util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from\n './Cast';\nlet wasmResizeBilinear: (\n  xId: number, batch: number, oldHeight: number, oldWidth: number,\n  numChannels: number, newHeight: number, newWidth: number,\n  alignCorners: number, halfPixelCenters:\n  number, outId: number) => void;\nfunction setup(backend: BackendWasm): void {\n  wasmResizeBilinear =\n  backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n    'number', // xId\n    'number', // batch\n    'number', //\n    oldHeight\n    'number', // oldWidth\n    'number', // numChannels\n    'number', // newHeight\n    'number', //\n    newWidth\n    'number', // alignCorners\n    'number', // halfPixelCenters\n    'number' // outId\n  ]);\n\n  function\n  resizeBilinear(args: {\n    backend: BackendWasm,\n    inputs: ResizeBilinearInputs,\n    attrs: ResizeBilinearAttrs\n  }):\n  TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {images} = inputs;\n    const {alignCorners,\n    halfPixelCenters, size} = attrs;\n    const [newHeight, newWidth] = size;\n    const [batch, oldHeight, oldWidth,\n    numChannels] = images.shape;\n    const outShape = [batch, newHeight, newWidth, numChannels];\n    let xData =\n    backend.dataIdMap.get(images.dataId);\n    let castedData;\n    if (xData.dtype !== 'float32') {\n      castedData =\n      cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n      xData =\n      backend.dataIdMap.get(castedData.dataId);\n    }\n    const xId = xData.id;\n    const out =\n    backend.makeOutput(outShape, 'float32');\n    if (util.sizeFromShape(images.shape) === 0) {\n      return out;\n    }\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmResizeBilinear(\n      xId, batch, oldHeight,\n      oldWidth, numChannels, newHeight, newWidth,\n      alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n    if\n    (castedData != null) {\n      backend.disposeData(castedData.dataId);\n    }\n    return out;\n  }\n\n  export const\n  resizeBilinearConfig: KernelConfig = {\n    kernelName: ResizeBilinear,\n    backendName: 'wasm',\n    setupFunc:\n    setup,\n    kernelFunc: resizeBilinear as {} as KernelFunc\n  };\n", "/*\n * @license\n * Copyright 2020 Google LLC.  
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=====\n*\n\nimport { KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { identity } from './Identity';\nimport { reshape } from './Reshape';\n\nlet wasmReverse: (\n  xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n  outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmReverse = backend.wasm.cwrap(Reverse, null, [\n    'number', // x_id\n    'array', // axes\n    'number', // axes_length\n    'array', // out_shape\n    'number', // out_shape_length\n    'number', // out_id\n  ]);\n\n  export function reverse(\n    args: { inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs }):\n    TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { x } = inputs;\n    const { dims } = attrs;\n\n    const axes = util.parseAxisParam(dims, x.shape);\n\n    if (x.shape.length === 0) {\n      return identity({ inputs: { x }, backend });\n    }\n\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n    const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n    wasmReverse(\n      xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n    const reshaped =\n      reshape({ inputs: { x: out }, attrs: { shape: x.shape }, backend);\n\n    backend.disposeData(out.dataId);\n    return reshaped;\n  }\n\n  export const reverseConfig: KernelConfig = {\n    kernelName: Reverse,\n    backendName: 'wasm',\n    kernelFunc: reverse as {} as KernelFunc,\n    setupFunc: setup\n  };}\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmRotate: (\n  xId: number, batch: number, imageHeight: number, imageWidth: number,\n  numChannels: number, radians: number, centerX: number, centerY: number,\n  fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n    'number', // xId\n    'number', // batch\n    'number', // imageHeight\n    'number', // imageWidth\n    'number', // numChannels\n    'number', // radians\n    'number', // centerX\n    'number', // centerY\n    'array', // fillBytes\n    'number', // fillLength\n    'number', // outId\n  ]);\n\n  export function rotateWithOffset(\n    args: { inputs: RotateWithOffsetInputs, backend: BackendWasm, attrs: RotateWithOffsetAttrs }):\n    TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { image } = inputs;\n    const { radians, fillValue, center } = attrs;\n\n    const out = backend.makeOutput(image.shape, image.dtype);\n    const imageId = backend.dataIdMap.get(image.dataId).id;\n    const outId = backend.dataIdMap.get(out.dataId).id;\n\n    const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n    const [centerX, centerY] =\n      backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n    const fillIsBlack = fillValue === 0;\n    const fullOpacityValue = 255;\n\n    const fillValues =\n      typeof fillValue === 'number' ?\n        [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n        [...fillValue, fullOpacityValue];\n\n    const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n    wasmRotate(\n      imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n      centerY, fillBytes, fillValues.length, outId);\n\n    return out;\n  }\n\n  export const rotateWithOffsetConfig: KernelConfig = {\n    kernelName: RotateWithOffset,\n    backendName: 'wasm',\n    kernelFunc: rotateWithOffset as {} as KernelFunc,\n
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setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from './types';\nlet wasmScatterNd: (\n  indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n  numUpdates: number, sliceSize: number, strides: Uint8Array,\n  outputSize: number, outId: number)\n=> void;\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n    'number', // indicesId\n    'number', // updatesId\n    'number', // dtype\n    'number', // sliceRank\n    'number', // numUpdates\n    'number', // sliceSize\n    'array', // strides\n    'number', // outputSize\n    'number' // outId\n  ]);\n  function scatterNd(\n    args: \n      {backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs}): \n      TensorInfo {\n    const {backend, inputs, attrs} = args;\n    const {indices, updates} = inputs;\n    const {shape} = attrs;\n    const out = backend.makeOutput(shape, updates.dtype);\n    if (util.sizeFromShape(shape) === 0) {\n      return out;\n    }\n    const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n      scatter_util.calculateShapes(updates, indices, shape);\n    const indicesData = backend.dataIdMap.get(indices.dataId);\n    const indicesId = indicesData.id;\n    const updatesData = backend.dataIdMap.get(updates.dataId);\n    const updatesId = updatesData.id;\n    const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize, stridesBytes, outputSize, outId);\n    return out;\n  }\n  export const scatterNdConfig: KernelConfig = {\n    kernelName: ScatterNd,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: scatterNd as {} as KernelFunc\n  }; \n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
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=====\n*\n\nimport { KernelConfig, KernelFunc, Select, SelectInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmSelect: (\n  conditionId: number, tId: number, eId: number, offset: number,\n  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n    'number', // conditionId\n    'number', // tId\n    'number', // eId\n    'number', // offset\n    'number', // outId\n  ]);\n\n  function select(args: { inputs: SelectInputs, backend: BackendWasm }) {\n    const { inputs, backend } = args;\n    const { condition, t, e } = inputs;\n    const conditionId = backend.dataIdMap.get(condition.dataId).id;\n    const tId = backend.dataIdMap.get(t.dataId).id;\n    const eId = backend.dataIdMap.get(e.dataId).id;\n    const out = backend.makeOutput(t.shape, t.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    const cRank = condition.shape.length;\n    const tRank = t.shape.length;\n    const offset = cRank === 0 || cRank > 1 || tRank === 1 ? 1 : \n    util.sizeFromShape(t.shape.slice(1));\n    wasmSelect(conditionId, tId, eId, offset, outId);\n    return out;\n  }\n\n  export const selectConfig: KernelConfig = {\n    kernelName: Select,\n    backendName: 'wasm',\n    kernelFunc: select as KernelFunc,\n    setupFunc: setup\n  }; \n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
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=====\n*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap('Sigmoid', null /* void */, [\n    'number', 'number'\n  ]);\n\n  function sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\n  TensorInfo {\n    const { backend, inputs: { x } } = args;\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const out = backend.makeOutput(x.shape, x.dtype);\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    // Short-circuit zero-sized tensors.\n    if (util.sizeFromShape(out.shape) === 0) {\n      return out;\n    }\n    wasmFunc(xId, outId);\n    return out;\n  }\n\n  export const sigmoidConfig: KernelConfig = {\n    kernelName: 'Sigmoid',\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: sigmoid as KernelFunc\n  }; \n  /**\n   * @license\n   * Copyright 2019 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
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=====\n*\n\nimport { KernelConfig, Sin } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from '../unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin); \n  /**\n   * @license\n   * Copyright 2020 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing, software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language governing permissions and\n   * limitations under the License.\n   */\n}
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*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId:
number, channels: number, batch: number) =>\n  void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n  'number', // xId\n  'number', // outId\n
'number', // channels\n  'number' // batch\n]);\n}\n\nfunction softmax(\n  args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n  TensorInfo {\n  const {backend, inputs: {logits}, attrs: {dim}} =
args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape,
logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channels = logits.shape[dim];\n
const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if
(util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return
out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2021 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND,
SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {padV2Config} from
'./PadV2';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nfunction
spaceToBatchND(args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: BackendWasm,\n  attrs:
SpaceToBatchNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape,
paddings} = attrs;\n\n  const prod = util.sizeFromShape(blockShape);\n\n  const completePaddings: Array<number,
number> = [[0, 0]];\n  completePaddings.push(...(paddings as Array<number, number>));\n\n  for (let i = 1 +
blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n\n  const paddedX =
padV2Config.kernelFunc({\n    inputs: {x},\n    backend,\n    attrs: {paddings: completePaddings, constantValue:
0}\n  }) as TensorInfo;\n\n  const reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape,
blockShape, prod, false);\n\n  const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n
    reshapedPaddedShape.length, blockShape.length, false);\n\n  const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n  const reshapeInputs:
ReshapeInputs = {x: paddedX};\n  const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n  const
paddedXReshaped =\n    reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n  const transposeInputs:
TransposeInputs = {x: paddedXReshaped};\n  const transposeAttrs:\n    TransposeAttrs = {perm:
permutedReshapedPaddedPermutation};\n  const paddedXT =\n    transpose({inputs: transposeInputs, backend,
attrs: transposeAttrs});\n\n  const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n  const
resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n  const result = reshape(\n    {inputs:
resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n  backend.disposeData(paddedX.dataId);\n
backend.disposeData(paddedXReshaped.dataId);\n  backend.disposeData(paddedXT.dataId);\n\n  return
result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n  kernelName: SpaceToBatchND,\n  backendName: 'wasm',\n  kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google
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=====\n\n*\n\nimport { KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util } from '@tensorflow/tfjs-core';\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { slice } from './Slice';\nexport function splitV(\n  args: { inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm }) {\n  const { inputs, attrs, backend } = args;\n  const { x } = inputs;\n  const { numOrSizeSplits, axis } = attrs;\n\n  const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n  const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n  const begin = new Array(x.shape.length).fill(0);\n  const size = x.shape.slice();\n  return splitSizes.map(s => {\n    const xSliceSize = [...size];\n    xSliceSize[$axis] = s;\n    const xSlice =\n      slice({ inputs: { x }, attrs: { begin, size: xSliceSize, backend });\n    begin[$axis] += s;\n    return xSlice;\n  });\n}\n\nexport const splitVConfig: KernelConfig = {\n  kernelName: SplitV,\n  backendName: 'wasm',\n  kernelFunc: splitV as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { KernelConfig, Sqrt } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { KernelConfig, Square } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { KernelConfig, SquaredDifference } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n  createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n\n
```



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*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n
'number', // alpha\n 'number', // dtype\n 'number', // out_id\n ]);\n}\n\nfunction step(\n args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out =
backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId,
alpha, CppDType[x.dtype], outId);\n\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName:
Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n", "/**\n *
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```

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*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from
'/Reshape';\n\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,
xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n
'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //
outShapeLength\n 'number', // outId\n ]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n
inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n
newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n
sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n
x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape:
finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const
outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes =
new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n
}\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n

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backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as { } as KernelFunc\n};\n",/**\n *
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the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'/binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n",/**\n * @license\n * Copyright 2019 Google LLC. All
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n    'number', // input_id\n
'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n ]);\n}\n\nfunction sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n
let\n  inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n
permuteAxesAndTranspose(x, axis, backend);\n\n  let reductionAxes = axes;\n  if (inputWasTransposed) {\n    const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was
not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =
transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n        reductionAxes.length,\n
input.shape.length);\n    }\n  }\n\n  backend_util.assertAxesAreInnerMostDims(\n    'sum', reductionAxes,\n
input.shape.length);\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of
the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n
const\n    newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: sum as { } as KernelFunc\n};\n",/**\n * @license\n * Copyright 2021 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
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*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n *
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*\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTile: (\n  xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n  newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n    'number', // x_id\n    'array', // x_shape\n    'number', //
x_shape.length\n    'array', // new_shape\n    'number', // new_shape.length\n    'number' // out_id\n  ]);\n}\n\nfunction tile(\n  args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const {reps} =
attrs;\n\n  const newShape: number[] = new Array(x.shape.length);\n  for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n  }\n  const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n  const out =
backend.makeOutput(newShape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n    CppDType[out.dtype], outId);\n  return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n  kernelName: Tile,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTopK:
(\n  xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n  xDtype: CppDType, k: number, sorted:
boolean, outValuesId: number,\n  outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n    'number', // xId\n    'array', // x.shape\n    'number',
// x.shape.length\n    'number', // x.dtype\n    'number', // k\n    'bool', // sorted\n    'number', // outValuesId\n
'number', // outIndicesId\n  ]);\n}\n\nexport const topk:\n  (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n  TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n

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    const {k, sorted} = attrs;\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const xShapeBytes
= new Uint8Array(new Int32Array(x.shape).buffer);\n    const outputShape = x.shape.slice();\n
outputShape[outputShape.length - 1] = k;\n    const outValues = backend.makeOutput(outputShape, x.dtype);\n
    const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n    const outIndices =
backend.makeOutput(outputShape, 'int32');\n    const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n    wasmTopK(\n        xId, xShapeBytes, x.shape.length,
CppType[x.dtype], k, sorted,\n        outValuesId, outIndicesId);\n\n    return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n    kernelName: TopK,\n    backendName: 'wasm',\n    setupFunc:
setup,\n    kernelFunc: topk as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n    imageId:
number, transformsId: number, isBatchTransform: boolean,\n    batch: number, outHeight: number, outWidth:
number, numChannels: number,\n    imageWidth: number, imageHeight: number, strides: Uint8Array,\n    stridesLength: number, interpolationModeId: number, fillModeId: number,\n    fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n    wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n        'number', // imageId\n        'number', // transformsId\n        'bool', // isBatchTransform\n        'number',
// batch\n        'number', // outHeight\n        'number', // outWidth\n        'number', // numChannels\n        'number', //
imageWidth\n        'number', // imageHeight\n        'array', // strides\n        'number', // stridesLength\n        'number', //
interpolationModeId\n        'number', // fillModeId\n        'number', // fillValue\n        'number' // outId\n
]);\n}\n\nfunction transform(\n    args:\n        {backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs});\n    TensorInfo {\n        const {backend, inputs, attrs} = args;\n        const {image, transforms} = inputs;\n
const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n        const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n        const [outHeight, outWidth] =\n            outputShape != null ? outputShape :
[imageHeight, imageWidth];\n        const outShape =\n            [batch, outHeight, outWidth,\n                numChannels] as
[number, number, number, number];\n        const strides =\n            new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n\n        const out = backend.makeOutput(outShape,
image.dtype);\n        const outId = backend.dataIdMap.get(out.dataId).id;\n\n        const imageData =
backend.dataIdMap.get(image.dataId);\n        const imageId = imageData.id;\n\n        const transformsData =
backend.dataIdMap.get(transforms.dataId);\n        const transformsId = transformsData.id;\n\n        const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n        let fillModeId;\n        switch (fillMode) {\n            case
'constant':\n                fillModeId = 1;\n                break;\n            case 'reflect':\n                fillModeId = 2;\n                break;\n            case 'wrap':\n
                fillModeId = 3;\n                break;\n            case 'nearest':\n                fillModeId = 4;\n                break;\n            default:\n                fillModeId = 1;\n                break;\n        }\n\n        wasmTransform(\n            imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n            outWidth, numChannels, imageWidth, imageHeight, strides,\n            image.shape.length - 1, interpolationModeId,
fillModeId, fillValue,\n            outId);\n\n        return out;\n    }\n}\n\nexport const transformConfig: KernelConfig = {\n
kernelName: Transform,\n    backendName: 'wasm',\n    setupFunc: setup,\n    kernelFunc: transform as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { slice } from\n './Slice';\nfunction unpack(\n  args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n  TensorInfo[] {\n  const { inputs, backend, attrs } = args;\n  const { value } = inputs;\n  let { axis } = attrs;\n  if (axis <\n  0) {\n    axis += value.shape.length;\n  }\n  const numOutputs = value.shape[axis];\n  const rank =\n  value.shape.length;\n  const outShape: number[] = new Array(rank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < rank;\n  i++) {\n    if (i !== axis) {\n      outShape[outIndex++] = value.shape[i];\n    }\n  }\n  const outs: TensorInfo[] = new\n  Array(numOutputs);\n  const begin = new Array(rank).fill(0);\n  const size = value.shape.slice();\n  size[axis] = 1;\n  for (let i = 0; i < outs.length; i++) {\n    begin[axis] = i;\n    outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },\n    backend});\n  }\n  return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n}\n\nexport const\n  unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'wasm',\n  kernelFunc: unpack as { } as\n  KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n  License.\n */
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from './backend_wasm';\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:\n BackendWasm }) {\n  const { inputs: { x }, backend } = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outVals = backendtypedArrayFromHeap(out);\n  outVals.fill(0);\n  return out;\n}\n\nexport const\n  zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'wasm',\n  kernelFunc: zerosLike\n  as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n  under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n  License.\n */
```

```
=====\n *\n//
```

We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport { KernelConfig, registerKernel } from '@tensorflow/tfjs-core';\nimport { fusedMatMulConfig } from './kernels/_FusedMatMul';\nimport { absConfig } from './kernels/Abs';\nimport { addConfig } from './kernels/Add';\nimport { addNConfig } from './kernels/AddN';\nimport { allConfig } from './kernels/All';\nimport { anyConfig } from './kernels/Any';\nimport { argMaxConfig } from './kernels/ArgMax';\nimport { avgPoolConfig } from './kernels/AvgPool';\nimport { batchMatMulConfig } from './kernels/BatchMatMul';\nimport { batchToSpaceNDConfig } from './kernels/BatchToSpaceND';\nimport { castConfig } from './kernels/Cast';\nimport { ceilConfig } from './kernels/Ceil';\nimport { clipByValueConfig } from './kernels/ClipByValue';\nimport { concatConfig } from './kernels/Concat';\nimport { conv2DConfig } from './kernels/Conv2D';\nimport { conv2DBackpropInputConfig } from './kernels/Conv2DBackpropInput';\nimport { cosConfig } from './kernels/Cos';\nimport { coshConfig } from './kernels/Cosh';\nimport { cropAndResizeConfig } from './kernels/CropAndResize';\nimport { cumsumConfig } from './kernels/Cumsum';\nimport { depthToSpaceConfig }

```

from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
 './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
 './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
 {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
 {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
 {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
 {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
 {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
 {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
 {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
 {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
 from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
 {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
 from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
 from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
 {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
 {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
 './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
 './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
 kernelConfigs: KernelConfig[] = [\n\n  absConfig,\n  addConfig,\n  addNConfig,\n  allConfig,\n  anyConfig,\n  argMaxConfig,\n  avgPoolConfig,\n  batchMatMulConfig,\n  batchToSpaceNDConfig,\n  castConfig,\n  ceilConfig,\n  clipByValueConfig,\n  concatConfig,\n  conv2DConfig,\n  conv2DBackpropInputConfig,\n  cosConfig,\n  coshConfig,\n  cropAndResizeConfig,\n  cumsumConfig,\n  depthToSpaceConfig,\n  depthwiseConv2dNativeConfig,\n  eluConfig,\n  equalConfig,\n  expConfig,\n  expandDimsConfig,\n  fillConfig,\n  flipLeftRightConfig,\n  floorConfig,\n  floorDivConfig,\n  fusedMatMulConfig,\n  fusedBatchNormConfig,\n  fusedConv2DConfig,\n  fusedDepthwiseConv2DConfig,\n  gatherNdConfig,\n  gatherV2Config,\n  greaterConfig,\n  greaterEqualConfig,\n  identityConfig,\n  leakyReluConfig,\n  lessConfig,\n  lessEqualConfig,\n  logConfig,\n  logicalAndConfig,\n  maxConfig,\n  maximumConfig,\n  maxPoolConfig,\n  meanConfig,\n  minConfig,\n  minimumConfig,\n  mirrorPadConfig,\n  multiplyConfig,\n  negConfig,\n  nonMaxSuppressionV3Config,\n  nonMaxSuppressionV4Config,\n  nonMaxSuppressionV5Config,\n  notEqualConfig,\n  oneHotConfig,\n  onesLikeConfig,\n  packConfig,\n  padV2Config,\n  powConfig,\n  preluConfig,\n  prodConfig,\n  rangeConfig,\n  realDivConfig,\n  reluConfig,\n  relu6Config,\n  reshapeConfig,\n  resizeBilinearConfig,\n  reverseConfig,\n  rotateWithOffsetConfig,\n  roundConfig,\n  rsqrtConfig,\n  scatterNdConfig,\n  selectConfig,\n  sigmoidConfig,\n  sinConfig,\n  sliceConfig,\n  softmaxConfig,\n  spaceToBatchNDConfig,\n  splitVConfig,\n  sqrtConfig,\n  squareConfig,\n  squaredDifferenceConfig,\n  stepConfig,\n  stridedSliceConfig,\n  subConfig,\n  sumConfig,\n  tanConfig,\n  tanhConfig,\n  tileConfig,\n  topKConfig,\n  transformConfig,\n  transposeConfig,\n  unpackConfig,\n  zerosLikeConfig,\n\n];

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minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n  registerKernel(kernelConfig);\n}\n", "/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n ]));\n\n**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n ]));\n } catch (e) {\n return false;\n }\n});\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(function(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function
GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAPF64}\nvar Module=typeof
WasmBackendModuleThreadedSimd!="undefined"?WasmBackendModuleThreadedSimd:{};\nvar
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});\nvar

```

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moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] }}var arguments_=[];var
thisProgram=\.this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\\\"path\\\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\"");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\"normalize\\\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\\\"utf8\\\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\\\"argv\\\"].length>1){thisProgram=process[\\\"argv\\\"]&[1].replace(/\\\\\\\\g,\\\"\\\\\\\"});arguments_=process[\\\"arg
v\\\"].slice(2);process[\\\"on\\\"](\\\"uncaughtException\\\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\\\"on\\\"](\\\"unhandledRejection\\\",abort);quit_=function(status){process[\\\"exit\\\"](status)};Module[\\\"insp
ect\\\"]=function(){return\"[Emscripten Module object]\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\\\"worker_threads\\\")}catch(e){console.error(\\\"The
\\\"worker_threads\\\" module is not supported in this node.js build - perhaps a newer version is needed?\");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!=\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!=\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !=\"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\\\"blob:\\\")!=\"0"){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\\\"\\\\\\\")+1)}else{scriptDirectory=\\\"\\\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\\\"fs\\\");if(!nodePath)nodePath=require(\\\"path\\\");filename=n
odePath[\"normalize\\\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\\\"utf8\\\");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\\\"GET\\\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new

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XMLHttpRequest;xhr.open(\ "GET",url,false);xhr.responseType=\ "arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)} }readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\ "GET",url,true);xhr.responseType=\ "arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return }onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title }else{ }if(ENVIRONMENT_IS_NODE){if(typeof
performance===\ "undefined"){global.performance=require(\ "perf_hooks").performance } }var
out=Module[\ "print"]||console.log.bind(console);var err=Module[\ "printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module[\ "arguments"]){arguments_=Module[\ "arguments"];if(Module[\ "thisProgram"]){thisProgram=
Module[\ "thisProgram"];if(Module[\ "quit"]){quit_=Module[\ "quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={ };if(!warnOnce.shown[text]){ warnOnce.shown[text]=1;er
r(text) } }var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\ "wasmBinary"]){wasmBinary=Module[\ "wasmBinary"];var
noExitRuntime=Module[\ "noExitRuntime"]||true;if(typeof WebAssembly!=="object"){ abort(\ "no native wasm
support detected") }var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){ abort(\ "Assertion failed: "+text) } }function getCFunc(ident){ var
func=Module[\ "_"+ident];assert(func,\ "Cannot call unknown function "+ident+", make sure it is exported");return
func }function ccall(ident,returnType,argTypes,args,opts){ var toC={\ "string":function(str){ var
ret=0;if(str!==null&&str!==undefined&&str!==0){ var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len) }return ret},\ "array":function(arr){ var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret } };function
convertReturnValue(ret){ if(returnType===\ "string")return UTF8ToString(ret);if(returnType===\ "boolean")return
Boolean(ret);return ret }var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){ for(var
i=0;i<args.length;i++){ var
converter=toC[argTypes[i]];if(converter){ if(stack===0)stack=stackSave();cArgs[i]=converter(args[i]) }else{ cArgs[i
]=args[i] } } }var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret }function cwrap(ident,returnType,argTypes,opts){ argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){ return type===\ "number" });var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){ return getCFunc(ident) }return
function(){ return ccall(ident,returnType,argTypes,arguments,opts) } }function
UTF8ArrayToString(heap,idx,maxBytesToRead){ var endIdx=idx+maxBytesToRead;var
str=\ "";while(!(idx>=endIdx)){ var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){ str+=String.fromCharCode(u0);continue } var
u1=heap[idx++]&63;if((u0&224)===192){ str+=String.fromCharCode((u0&31)<<6|u1);continue } var
u2=heap[idx++]&63;if((u0&240)===224){ u0=(u0&15)<<12|u1<<6|u2 }else{ u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63 }if(u0<65536){ str+=String.fromCharCode(u0) }else{ var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023) } }return str }function
UTF8ToString(ptr,maxBytesToRead){ return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\ "" }function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){ if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){ var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023) }if(u<=127){ if(outIdx>=endIdx)break;heap[outIdx++
]=u }else if(u<=2047){ if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63 }else
if(u<=65535){ if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63 }else{ if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[

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outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63 } heap[outIdx]=0;return outIdx-startIdx }function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){ var
len=0;for(var i=0;i<str.length;++i){ var
u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len }function
writeArrayToMemory(array,buffer){ GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMem
emory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctor
s()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=Module["preRun"];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=Module["postRun"];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module

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["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("\Pthread aborting at \"+(new
Error).stack);what+="\";err(what);ABORT=true;EXITSTATUS=1;what="\abort(\"+what+\"). Build with -s
ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\"data:application/octet-stream;base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-
simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the
wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\"+wasmBinaryFile+\"\"}return response[\"arrayBuffer\"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency(\"wasm-
instantiate\")}})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0}});function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB

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USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOCSS:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADDE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOS
TDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
_emsripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emsripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emsripten_futex_wake\"]=_emsripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.threads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread.threads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var
pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emsripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emsripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l

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length>0){PThread.threadExitHandlers.pop()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors(),runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);_emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\":"exit\"])}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({"cmd\":"cancelDone\"])},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[_emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[_emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList\"])}}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d["thread\"])}}else
if(cmd===\"killThread\"){killThread(d["thread\"])}}else
if(cmd===\"cancelThread\"){cancelThread(d["thread\"])}}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d["threadId"]+\":
\"+d["text\"])}}else if(cmd===\"printErr\"){err(\"Thread \"+d["threadId"]+\": \"+d["text\"])}}else
if(cmd===\"alert\"){alert(\"Thread \"+d["threadId"]+\": \"+d["text\"])}}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\"exitProcess\"){try{exit(d["returnCode\"])}}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent

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an error! \" + e.filename + \":\" + e.lineno + \":
\" + e.message));if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\": \"load\", \"urlOrBlob\": Module[\"mainScriptUrlOrBlob\"]|_scriptDir, \"wasmMemory\": wasmMe
memory, \"wasmModule\": wasmModule}),allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-
backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs)),getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,argv){return
wasmTable.get(ptr)(argv)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
__assert_fail(condition,filename,line,func){abort(\"Assertion failed: \" + UTF8ToString(condition) + \", at:
\" + [filename?UTF8ToString(filename): \"unknown filename\", line, func?UTF8ToString(func): \"unknown
function\"])}function __call_main(argc,argv){var returnValue=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!=\"undefined"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[__errno_location()>>2]=value;return
value}function _atexit(func,argv){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,argv)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\": \"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId, \"cmd\": \"processThreadQueu
e\"})}else{var pthread=PThread.threads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\": \"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function

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_emsripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("\os").cpus().length;return
navigator["\hardwareConcurrency"]}}function _emsripten_proxy_to_main_thread_js(index, sync){ var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){ var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emsripten_run_in_main_runtime_thread_js(index, serializedNumCallArgs, args, sync);stackRestore(stack);retu
n ret}var _emsripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr, buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){ var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emsripten_receive_on_main_thread_js(index, numCallArgs, args){ _emsripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){ _emsripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null, _emsripten_receive_on_main_thread_js_callArgs)}function
_emsripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emsripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emsripten_resize_heap(requestedSize){var
oldSize=_emsripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){ var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize, requestedSize
+100663296);var
newSize=Math.min(maxHeapSize, alignUp(Math.max(requestedSize, overGrownHeapSize), 65536));var
replacement=emsripten_realloc_buffer(newSize);if(replacement){return true} }return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction, precedence
, argsList){function arraysHaveEqualContent(arrA, arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){ var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList, args
List))return}}JSEvents.deferredCalls.push({targetFunction:targetFunction, precedence:precedence, argsList:argsList
});JSEvents.deferredCalls.sort(function(x, y){return
x.precedence<y.precedence}),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;+i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i, 1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;+i){ var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i, 1);--
i;call.targetFunction.apply(null, call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target, event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;+i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var

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h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas);GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=\"undefined\"?document:0,typeof window!=\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o

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n_target_thread(targetThread,target,width,height);return 1 }else{return-4}return 0}function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n_emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){ var
canvas=findCanvasEventTarget(target);if(canvas){return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ext["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcount){ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(mode,count,type,indices,primcount){ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};return 1 } }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1 } }function __webgl_enable_WEBGL_draw_buffers(ctx){ var
ext=ctx.getExtension("WEBGL_draw_buffers");if(ext){ ctx["drawBuffers"]=function(n,bufs){ext["drawBuffers
WEBGL"](n,bufs)};return 1 } }function
__webgl_enable_WEBGL_multi_draw(ctx){return!(ctx.multiDrawWebgl=ctx.getExtension("WEBGL_multi_dra
w"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{ },offscreenCanvases:{ },timerQueriesEXT:[],programInfos:{ },stringCache:{ },unpackAlignment:4,recordError:
function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){ var
ret=GL.counter++;for(var i=table.length;i<ret;i++){ table[i]=null }return
ret},getSource:function(shader,count,string,length){ var source="";for(var i=0;i<count;++i){ var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32)[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){ var
ctx=canvas.getContext("webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){ var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={ handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx };if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===undefined||webGLContextAttributes.enableExtensions
ByDefault){ GL.initExtensions(context) }return
handle},makeContextCurrent:function(contextHandle){ GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){ return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contex
tHandle])GL.currentContext=null;if(typeof
JSEvents===object)JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){ if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension

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sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension("\
EXT_disjoint_timer_query");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf("lose_context")<0&&ext.inde
xOf("debug")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)=="\"){name=name.slice(0,name.lastIndexOf("\["))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+"\["+j+"]";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=["default","low-power","high-performance"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={"alpha":!!GROWABLE_HEAP_I32()[a+(0>>2)],"depth":!!GROWABLE_HEAP_I32()[a+(4
>>2)],"stencil":!!GROWABLE_HEAP_I32()[a+(8>>2)],"antialias":!!GROWABLE_HEAP_I32()[a+(12>>2)],"p
remultipliedAlpha":!!GROWABLE_HEAP_I32()[a+(16>>2)],"preserveDrawingBuffer":!!GROWABLE_HEAP_
I32()[a+(20>>2)],"powerPreference":__emscripten_webgl_power_preferences[powerPreference],"\failIfMajorPerf
ormanceCaveat":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iiov,iiovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(5,1,fd,iiov,iiovcnt,pnum);var num=0;for(var i=0;i<iiovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iiov+i*8>>2];var len=GROWABLE_HEAP_I32()[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)}})f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread

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ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread pthreads[threadParams.pthread_ptr]={ worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr };var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd\\":\\"run\\",\\"start_routine\\":threadParams.startRoutine,\\"arg\\":threadParams.arg,\\"threadInfoStruct\\":thre
adParams.pthread_ptr,\\"stackBase\\":threadParams.stackBase,\\"stackSize\\":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
__pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\\"undefined\\"){err(\\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return
6}if(!pthread_ptr){err(\\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
__emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase=
stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\\\"spawnThread\\\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=__pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled===2)throw\\"Canceled!\"}function
__emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\\"Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\\"pthread_join attempted on a null thread
pointer!\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&__pthread_self()===thread){err(\\"PThread
\\\"+thread+\\\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&__emscripten_main_browser_thread_id()===thread){err(\\"Main thread
\\\"+thread+\\\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var

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self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err("\pthread_join attempted on thread
\"+thread+\", which does not point to a valid thread, or does not exist anymore!");return
ERRNO_CODES.ESRCH}var
detached=Atoms.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err("Attempted to join thread
\"+thread+\", which was already detached!");return
ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atoms.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus===1){var
threadExitCode=Atoms.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atoms.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({"cmd":"cleanupThread","thread":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}}_pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thre
ad_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}function _pthread_join(thread,status){return _emscripten_do_pthread_join(thread,status,true)}function
_sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator==="object")return navigator["hardwareConcurrency"]||1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\"e\":__assert_fail,\"r\":__call_main,\"x\":_emscripten_notify_thread_queue,\"b\":_abort,\"y\":
_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"
c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l
ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_ca
nvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscrip
ten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Mo
dule[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthr
ead_join,\"t\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var

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_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=Module["asm"]["F"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"]["G"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"]["H"]).apply(null,arguments)};var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"]["J"]).apply(null,arguments)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"]["K"]).apply(null,arguments)};var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"]["L"]).apply(null,arguments)};var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"]["M"]).apply(null,arguments)};var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"]["N"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"]["O"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"]["P"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"]["Q"]).apply(null,arguments)};var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"]["R"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"]["S"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"]["T"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"]["U"]).apply(null,arguments)};var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"]["V"]).apply(null,arguments)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"]["W"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"]["X"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"]["Y"]).apply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"]["Z"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"]["_"]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["$"]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["aa"]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["ba"]).apply(null,arguments)};var

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_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][_"ca"]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][_"da"]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][_"ea"]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][_"fa"]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][_"ga"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["asm"][_"ha"]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][_"ia"]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][_"ja"]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][_"ka"]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][_"la"]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][_"ma"]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][_"na"]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][_"oa"]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][_"pa"]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][_"qa"]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][_"ra"]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][_"sa"]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][_"ta"]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][_"ua"]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][_"va"]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][_"wa"]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][_"xa"]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][_"ya"]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][_"za"]).apply(null,arguments)};var

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_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var

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_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["_a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_thread_self=Module["_thread_self"]=function(){return(_thread_self=Module["_thread_self"]=Module["asm"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=function(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"][["ob"]]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"][["pb"]]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"][["qb"]]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"][["rb"]]).apply(null,arguments)};var

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__emscripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module["__emscripten_do_dispatch_to_thread"]=Module["asm"][["sb"]]).apply(n
ull,arguments)};var
__emscripten_sync_run_in_main_thread_4=Module["__emscripten_sync_run_in_main_thread_4"]=function(){retur
n(__emscripten_sync_run_in_main_thread_4=Module["__emscripten_sync_run_in_main_thread_4"]=Module["asm"]
)[["tb"]]).apply(null,arguments)};var
__emscripten_run_in_main_runtime_thread_js=Module["__emscripten_run_in_main_runtime_thread_js"]=function(
){return(__emscripten_run_in_main_runtime_thread_js=Module["__emscripten_run_in_main_runtime_thread_js"]=
Module["asm"][["ub"]]).apply(null,arguments)};var
__emscripten_call_on_thread=Module["__emscripten_call_on_thread"]=function(){return(__emscripten_call_on_t
hread=Module["__emscripten_call_on_thread"]=Module["asm"][["vb"]]).apply(null,arguments)};var
__emscripten_tls_init=Module["__emscripten_tls_init"]=function(){return(__emscripten_tls_init=Module["__emscri
pten_tls_init"]=Module["asm"][["wb"]]).apply(null,arguments)};var
__emscripten_thread_init=Module["__emscripten_thread_init"]=function(){return(__emscripten_thread_init=Mod
ule["__emscripten_thread_init"]=Module["asm"][["xb"]]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"][["yb"]]).a
pply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"
][["zb"]]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"][["Ab"
]).apply(null,arguments)};var
__emscripten_stack_set_limits=Module["__emscripten_stack_set_limits"]=function(){return(__emscripten_stack_set_
limits=Module["__emscripten_stack_set_limits"]=Module["asm"][["Bb"]]).apply(null,arguments)};var
__memalign=Module["__memalign"]=function(){return(__memalign=Module["__memalign"]=Module["asm"][["Cb
"]]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module["__emscripten_allow_main_runtime_queued_calls"]=1
0512;var
__emscripten_main_thread_futex=Module["__emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap
;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmmemory"]=wasmmemory;Module
["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="\ExitStatus";this.message="\Program terminated with
exit(\'+status+\')";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args|arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("\Running...");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"]("\n"),1);doRun()},1)}else{doRun()}}Module["run"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({"cmd":"exitProcess","returnCode":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRuni
me();if(Module["onExit"])Module["onExit"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n);nif (typeof exports === 'object' && typeof

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module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports['WasmBackendModuleThreadedSimd'] =
WasmBackendModuleThreadedSimd;\n", "export const wasmWorkerContents = 'var Module={ };function
threadPrintErr(){ var text=Array.prototype.slice.call(arguments).join(" ");console.error(text) }function
threadAlert(){ var text=Array.prototype.slice.call(arguments).join("
\n");postMessage({ cmd:"alert",text:text,threadId:Module["_pthread_self"]()})} var
err=threadPrintErr;this.alert=threadAlert;Module["instantiateWasm"]=function(info,receiveInstance){ var
instance=new
WebAssembly.Instance(Module["wasmModule"],info);Module["wasmModule"]=null;receiveInstance(instance);r
eturn instance.exports };function
moduleLoaded(){ }this.onmessage=function(e){ try {if(e.data.cmd===\load"){ Module["wasmModule"]=e.data.wa
smModule;Module["wasmMemory"]=e.data.wasmMemory;Module["buffer"]=Module["wasmMemory"].buffer;
Module["ENVIRONMENT_IS_PTHREAD"]=true;if(typeof
e.data.urlOrBlob===\string"){ importScripts(e.data.urlOrBlob) }else { var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)
} WasmBackendModuleThreadedSimd(Module).then(function(instance){ Module=instance;moduleLoaded()})} else
if(e.data.cmd===\objectTransfer"){ Module["PThread"].receiveObjectTransfer(e.data) } else
if(e.data.cmd===\run"){ Module["__performance_now_clock_drift"]=performance.now()-
e.data.time;Module["__emscripten_thread_init"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module["establishStackSpace"](top,max);Module["_emscripten_tls_init"](
);Module["PThread"].receiveObjectTransfer(e.data);Module["PThread"].setThreadStatus(Module["_pthread_self
"](),1);try { var
result=Module["invokeEntryPoint"](e.data.start_routine,e.data.arg);if(!Module["getNoExitRuntime"]())Module[
"PThread"].threadExit(result) } catch(ex){ if(ex===\Canceled!){ Module["PThread"].threadCancel() } else
if(ex!=\unwind){ if(ex instanceof
Module["ExitStatus"]){ if(Module["getNoExitRuntime"]()){ } else { Module["PThread"].threadExit(ex.status) } } el
se { Module["PThread"].threadExit(-2);throw ex } } } else
if(e.data.cmd===\cancel){ if(Module["_pthread_self"]()){ Module["PThread"].threadCancel() } } else
if(e.data.target===\setimmediate){ } else
if(e.data.cmd===\processThreadQueue){ if(Module["_pthread_self"]()){ Module["_emscripten_current_thread
_process_queued_calls"]() } } else { err(\worker.js received unknown command
\n"+e.data.cmd);err(e.data) } } catch(ex){ err(\worker.js onmessage() captured an uncaught exception:
\n"+ex);if(ex&&ex.stack)err(ex.stack);throw ex } } ;if(typeof process===\object"&&typeof
process.versions===\object"&&typeof process.versions.node===\string"){ self={ location:{ href:__filename } };var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\worker_threads");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\message",function(data){ onmessage({ data:data })});var
nodeFS=require(\fs");var nodeRead=function(filename){ return nodeFS.readFileSync(filename,\utf8") };function
globalEval(x){ global.require=require;global.Module=Module;eval.call(null,x) }importScripts=function(f){ globalEva
l(nodeRead(f) );postMessage=function(msg){ parentPort.postMessage(msg) };if(typeof
performance===\undefined"){ performance={ now:function(){ return Date.now() } } } ;", "\nvar
WasmBackendModule = (function() { \n var _scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined')
_scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) { \n WasmBackendModule =
WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!=="undefined"?WasmBackendModule: { };var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new

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Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={ };var key;for(key in
Module){if(Module.hasOwnProperty(key)){ moduleOverrides[key]=Module[key] }}var arguments_=[];var
thisProgram=("./this.program");var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory="";function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"^"}else{scriptDirectory=__dirname+"^"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");};readBinary=function readBinary(filename){ var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){ thisProgram=process["argv"][1].replace(/\\/g,"^")}arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print} }else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(!_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf("^")+1)}else{scriptDirectory=""}}read_=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} }else{ }var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"]){arguments_=Module["arguments"];}if(Module["thisProgram"]){thisProgram=
Module["thisProgram"];}if(Module["quit"]){quit_=Module["quit"];}var

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wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function '"+ident+"', make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63;if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10|u1&1023)if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var

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INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=Module["preRun"];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=Module["postRun"];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nu
ll}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what+="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))})}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming==="function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-

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origin\").then(function(response){ var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)}))} else {return
instantiateArrayBuffer(receiveInstantiatedSource)} if(Module[\"instantiateWasm\"]){ try {var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports } catch(e){ err(\"Module.instantiateWasm
callback failed with error: \"+e);return false } } instantiateAsync().catch(readyPromiseReject);return { } } function
callRuntimeCallbacks(callbacks){ while(callbacks.length>0){ var callback=callbacks.shift();if(typeof
callback===\"function\") { callback(Module);continue } var func=callback.func;if(typeof
func===\"number\") { if(callback.arg===undefined){ wasmTable.get(func)() } else { wasmTable.get(func)(callback.arg)
} } else { func(callback.arg===undefined?null:callback.arg) } } } function _abort(){ abort() } function
_emscipten_memcpy_big(dest,src,num){ HEAPU8.copyWithin(dest,src,src+num) } function
_emscipten_get_heap_size(){ return HEAPU8.length } function
emscipten_realloc_buffer(size){ try { wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1 } catch(e){ } } function _emscipten_resize_heap(requestedSize){ var oldSize=_emscipten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){ return false } for(var
cutDown=1;cutDown<=4;cutDown*=2){ var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscipten_realloc_buffer(newSize);if(replacement){ return true } } return false } var
SYSCALLS={ mappings: { }, buffers: [null,[],[]], printChar: function(stream,curr) { var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){ (stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0 } else { buffer.push(curr) } }, varargs: undefined, get: function(ptr) { SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret }, getStr: function(ptr) { var ret=UTF8ToString(ptr);return
ret }, get64: function(low,high) { return low } }, function _fd_close(fd) { return 0 } function
_fd_seek(fd,offset_low,offset_high,whence,newOffset) { } function _fd_write(fd,iiov,iovcnt,pnum) { var num=0;for(var
i=0;i<iovcnt;i++){ var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){ SYSCALLS.printChar(fd,HEAPU8[ptr+j]) } num+=len } HEAP32[pnum>>2]=num;return 0 } function
_thread_create() { return 6 } function _pthread_join() { return 28 } function
setErrNo(value) { HEAP32[___errno_location()>>2]=value;return value } function
_sysconf(name) { switch(name) { case 30: return 16384; case 85: var maxHeapSize=2147483648;return
maxHeapSize/16384; case 132: case 133: case 12: case 137: case 138: case 15: case 235: case 16: case 17: case 18: case
19: case 20: case 149: case 13: case 10: case 236: case 153: case 9: case 21: case 22: case 159: case 154: case 14: case
77: case 78: case 139: case 82: case 68: case 67: case 164: case 11: case 29: case 47: case 48: case 95: case 52: case 51: case
46: return 200809; case 27: case 246: case 127: case 128: case 23: case 24: case 160: case 161: case 181: case 182: case
242: case 183: case 184: case 243: case 244: case 245: case 165: case 178: case 179: case 49: case 50: case 168: case
169: case 175: case 170: case 171: case 172: case 97: case 76: case 32: case 173: case 35: case 80: case 81: case 79: return-
1; case 176: case 177: case 7: case 155: case 8: case 157: case 125: case 126: case 92: case 93: case 129: case 130: case
131: case 94: case 91: return 1; case 74: case 60: case 69: case 70: case 4: return 1024; case 31: case 42: case 72: return
32; case 87: case 26: case 33: return 2147483647; case 34: case 1: return 47839; case 38: case 36: return 99; case 43: case
37: return 2048; case 0: return 2097152; case 3: return 65536; case 28: return 32768; case 44: return 32767; case 75: return
16384; case 39: return 1e3; case 89: return 700; case 71: return 256; case 40: return 255; case 2: return 100; case 180: return
64; case 25: return 20; case 5: return 16; case 6: return 6; case 73: return 4; case 84: { if(typeof
navigator===\"object\") return navigator[\"hardwareConcurrency\"]||1; return 1 } } setErrNo(28); return -1 } var
asmLibraryArg={ \"a\": _abort, \"d\": _emscipten_memcpy_big, \"e\": _emscipten_resize_heap, \"f\": _fd_close, \"c\": _f
d_seek, \"b\": _fd_write, \"h\": _pthread_create, \"g\": _pthread_join, \"i\": _sysconf }; var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){ return(__wasm_call_ctors=Module[\"__wasm

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_call_ctors"]=Module["asm"][["k"]].apply(null,arguments));var
_init=Module["_init"]=function(){return(_init=Module["_init"]=Module["asm"][["l"]].apply(null,arguments));
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Module["_init_with_threads_count"]=Module["asm"][["m"]].apply(null,arguments));var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads_count"]=Module["asm"][["n"]].apply(null,arguments));var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=Module["asm"][["o"]].apply(null,arguments));var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm"][["p"]].apply(null,arguments));var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm"][["q"]].apply(null,arguments));var
_Abs=Module["_Abs"]=function(){return(_Abs=Module["_Abs"]=Module["asm"][["s"]].apply(null,arguments));var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm"][["t"]].apply(null,arguments));var
_AddN=Module["_AddN"]=function(){return(_AddN=Module["_AddN"]=Module["asm"][["u"]].apply(null,arguments));var
_All=Module["_All"]=function(){return(_All=Module["_All"]=Module["asm"][["v"]].apply(null,arguments));
var
_Any=Module["_Any"]=function(){return(_Any=Module["_Any"]=Module["asm"][["w"]].apply(null,arguments));var
_ArgMax=Module["_ArgMax"]=function(){return(_ArgMax=Module["_ArgMax"]=Module["asm"][["x"]].apply(null,arguments));var
_AvgPool=Module["_AvgPool"]=function(){return(_AvgPool=Module["_AvgPool"]=Module["asm"][["y"]].apply(null,arguments));var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm"][["z"]].apply(null,arguments));var
_Ceil=Module["_Ceil"]=function(){return(_Ceil=Module["_Ceil"]=Module["asm"][["A"]].apply(null,arguments));var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm"][["B"]].apply(null,arguments));var
_Conv2D=Module["_Conv2D"]=function(){return(_Conv2D=Module["_Conv2D"]=Module["asm"][["C"]].apply(null,arguments));var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm"][["D"]].apply(null,arguments));var
_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][["E"]].apply(null,arguments));var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][["F"]].apply(null,arguments));var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][["G"]].apply(null,arguments));var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][["H"]].apply(null,arguments));var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][["I"]].apply(null,arguments));var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["asm"][["J"]].apply(null,arguments));var

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odule["_DepthwiseConv2dNative"]=Module["asm"]["J"].apply(null,arguments);var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"]["K"].apply(null,arguments))
;var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"]["L"].apply(null,arg
uments));var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"]["M"].apply(null,argument
s));var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Modul
e["asm"]["N"].apply(null,arguments));var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"]["O"].apply(null,argu
ments));var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"]["P"].
apply(null,arguments));var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchN
orm"]=Module["asm"]["Q"].apply(null,arguments));var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Modu
le["asm"]["R"].apply(null,arguments));var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=M
odule["_FusedDepthwiseConv2D"]=Module["asm"]["S"].apply(null,arguments));var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"]["T"].apply(null
,arguments));var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"]["U"
]).apply(null,arguments);var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"]["V"].apply(
null,arguments));var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module[
"asm"]["W"].apply(null,arguments));var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"]["
X"].apply(null,arguments));var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"]["Y"].apply(null,argume
nts));var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"]["
Z"].apply(null,arguments));var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"]["_"].apply(null,arguments
));var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm
"]["$"].apply(null,arguments));var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"]["aa"].apply(null,argume
nts));var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"]["ba"].
apply(null,arguments));var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"]["ca"
]).apply(null,arguments);var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"]["da"].apply(null,ar
guments));var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"]["ea"].apply(null,argumen
ts));var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"]["fa\

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)].apply(null,arguments));var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["ga"]]).apply(null,arguments));var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).apply(null,arguments));var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,arguments));var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments));var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments));var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments));var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments));var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments));var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(null,arguments));var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments));var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments));var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments));var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments));var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments));var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments));var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments));var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments));var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments));var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments));var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments));var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments));var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments));var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments));var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)

```

```

};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"]["Ea"]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"]["Fa"]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"]["Ga"]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"]["Ha"]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"]["Ia"]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"]["Ja"]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"]["Ka"]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"]["La"]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"]["Ma"]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"]["Na"]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"]["Oa"]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"]["Pa"]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"]["Qa"]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"]["Ra"]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"]["Sa"]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"]["Ta"]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"]["Ua"]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"]["Va"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["Wa"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]["Xa"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ya"]).apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(

```

```
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"]("Running...");setTimeout(function(){setTimeout(function(){Mo
Module["setStatus"](""),1);doRun(),1})else{doRun()}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=Module["preInit"];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n);\n\n};\n\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\n\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';\n\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.worker.js';\n\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\n\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *
util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n
this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values
as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n
memoryOffset);\n }\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return
this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset,
dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n
}\n\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false
otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n
```

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disposeData(dataId: DataId, force = false): boolean {\n  if (this.dataIdMap.has(dataId)) {\n    const data =
this.dataIdMap.get(dataId);\n    data.refCount--;\n    if (!force && data.refCount > 0) {\n      return false;\n    }\n    this.wasm._free(data.memoryOffset);\n    this.wasm.tfjs.disposeData(data.id);\n    this.dataIdMap.delete(dataId);\n  }\n  return true;\n}\n\n/** Return refCount of a `TensorData`. */\nrefCount(dataId: DataId): number {\n  if (this.dataIdMap.has(dataId)) {\n    const tensorData =
this.dataIdMap.get(dataId);\n    return tensorData.refCount;\n  }\n  return 0;\n}\n\nincRef(dataId: DataId) {\n  const data = this.dataIdMap.get(dataId);\n  if (data != null) {\n    data.refCount++;\n  }\n}\n\nfloatPrecision():
32 {\n  return 32;\n}\n\n// Returns the memory offset of a tensor. Useful for debugging and unit\n// testing.\ngetMemoryOffset(dataId: DataId): number {\n  return this.dataIdMap.get(dataId).memoryOffset;\n}\n\ndispose() {\n  this.wasm.tfjs.dispose();\n  if ('PThread' in this.wasm) {\n    this.wasm.PThread.terminateAllThreads();\n  }\n  this.wasm = null;\n}\n\nmemory() {\n  return {unreliable:
false};\n}\n\n/**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated
elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n *^\n makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number):\n  TensorInfo {\n    let dataId: {};\n    if (memoryOffset
== null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id =
this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n    backend_util.TypedArray {\n      const buffer = this.wasm.HEAPU8.buffer;\n      const
{memoryOffset} = this.dataIdMap.get(dataId);\n      const size = util.sizeFromShape(shape);\n      switch (dtype) {\n
case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new
Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n        return new Uint8Array(buffer, memoryOffset,
size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n      }\n    }\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// miniprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n    if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n    }\n    response.arrayBuffer().then(binary => {\n
      WebAssembly.instantiate(binary, imports).then(output => {\n        callback(output.instance, output.module);\n
      });\n    });\n  });\n  return {};\n};\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n  simdSupported: boolean, threadsSupported: boolean,\n  wasmModuleFolder: string) {\n  if (wasmPath != null) {\n
// If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n    return
wasmPath;\n  }\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&
threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =
'tfjs-backend-wasm-simd.wasm';\n  }\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n    }\n  }\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n *^\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n  const
[simdSupported, threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n  return new Promise((resolve, reject) => {\n
const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides the Emscripten
module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n     *
@param prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n      const response = wasmWorkerContents;\n      const blob = new
Blob([response], {type: 'application/javascript'});\n      return URL.createObjectURL(blob);\n    }\n    if

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(path.endsWith('.wasm')) {\n    return getPathToWasmBinary(\n        simdSupported as boolean,
threadsSupported as boolean,\n        wasmPathPrefix != null ? wasmPathPrefix : prefix);\n    }\n    return prefix
+ path;\n    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    // https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n    factoryConfig.instantiateWasm =\n    createInstantiateWasmFunc(getPathToWasmBinary(\n        simdSupported as boolean, threadsSupported as
boolean,\n        wasmPathPrefix != null ? wasmPathPrefix : ''));\n    }\n\n    let initialized = false;\n
factoryConfig.onAbort = () => {\n    if (initialized) {\n        // Emscripten already called console.warn so no need to
double log.\n        return;\n    }\n    if (initAborted) {\n        // Emscripten calls `onAbort` twice, resulting in double
error\n        // messages.\n        return;\n    }\n    initAborted = true;\n    const rejectMsg =\n        'Make sure the
server can serve the `.wasm` file relative to the ' +\n        'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n    };\n\n    let wasm: Promise<BackendWasmModule>;\n    // If `wasmPath` has
been defined we must initialize the vanilla module.\n    if (threadsSupported && simdSupported && wasmPath ==
null) {\n    factoryConfig.mainScriptUrlOrBlob = new Blob(\n        [\n            var WasmBackendModuleThreadedSimd = `
+\n            wasmFactoryThreadedSimd.toString()),\n            {type: 'text/javascript'});\n        wasm =
wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n        // The wasmFactory works for both vanilla and SIMD
binaries.\n        wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM module has been successfully
created by the factory.\n    // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n    initialized = true;\n    initAborted = false;\n\n    const voidReturnType: string =
null;\n    // Using the tfjs namespace to avoid conflict with emscripten's API.\n    module.tfjs = {\n    init:
module.cwrap('init', null, []),\n    initWithThreadsCount:\n        module.cwrap('init_with_threads_count', null,
['number']),\n    getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n    registerTensor:
module.cwrap(\n        'register_tensor', null,\n        [\n            'number', // id\n            'number', // size\n
            'number', // memoryOffset\n        ]),\n    disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n    dispose: module.cwrap('dispose', voidReturnType, []),\n    };\n\n    resolve({wasm: module});\n
});\n    });\n\n\nfunction typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n    switch (dtype) {\n    case 'float32':\n        return new Float32Array(buffer);\n    case
'int32':\n        return new Int32Array(buffer);\n    case 'bool':\n        return new Uint8Array(buffer);\n    default:\n
throw new Error(`Unknown dtype ${dtype}`);\n    }\n\n\nconst wasmBinaryNames = [\n    'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n    'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n
type WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n    deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n        ' will be removed in a future release.);\n
if (initAborted) {\n    throw new Error(\n        'The WASM backend was already initialized. Make sure you call ' +\n
        `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n    }\n    wasmPath = path;\n    customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * @param js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
```\n * @param prefixOrFileMap This can be either a string or object.\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *

```

SIMD-enabled, threading-enabled, etc.).  
 \* - (object) Mapping from names of WASM binaries to custom full paths specifying the locations of those binaries. This is useful if your WASM binaries are not all located in the same directory, or if your WASM binaries have been renamed.  
 \* @param usePlatformFetch optional boolean to use platform fetch to download the wasm file, default to false.  
 \* @doc {heading: 'Environment', namespace: 'wasm'}  
 \*^next function setWasmPaths(prefixOrFileMap: string | {[key in WasmBinaryName]?: string}), usePlatformFetch = false): void {  
 if (initAborted) {  
 throw new Error('The WASM backend was already initialized. Make sure you call ' + setWasmPaths() before you call ' + tf.setBackend() or ' + tf.ready());  
 }  
 if (typeof prefixOrFileMap === 'string') {  
 wasmPathPrefix = prefixOrFileMap;  
 } else {  
 wasmFileMap = prefixOrFileMap;  
 const missingPaths = wasmBinaryNames.filter(name => wasmFileMap[name] == null);  
 if (missingPaths.length > 0) {  
 throw new Error('There were no entries found for the following binaries: ' + missingPaths.join(','). Please either call setWasmPaths with a ' + map providing a path for each binary, or with a string indicating ' + the directory where all the binaries can be found.);  
 }  
 }  
 customFetch = usePlatformFetch;  
 }  
 }  
 \*^next function resetWasmPath(): void {  
 wasmPath = null;  
 wasmPathPrefix = null;  
 wasmFileMap = {};  
 customFetch = false;  
 initAborted = false;  
 }  
 }  
 }  
 }  
 \*^next function setThreadsCount(numThreads: number) {  
 threadsCount = numThreads;  
 }  
 }  
 \*^next function getThreadsCount(): number {  
 if (actualThreadsCount === -1) {  
 throw new Error('WASM backend not initialized.);  
 }  
 return actualThreadsCount;  
 }  
 }  
 }  
 }  
 \* @license See the LICENSE file.  
 \* This code is auto-generated, do not modify this file!  
 \* const version = '3.11.0';  
 \*^next {  
 version};  
 }  
 \* @license  
 \* Copyright 2020 Google LLC. All Rights Reserved.  
 \* Licensed under the Apache License, Version 2.0 (the "License");  
 \* you may not use this file except in compliance with the License.  
 \* You may obtain a copy of the License at  
 \* http://www.apache.org/licenses/LICENSE-2.0  
 \* Unless required by applicable law or agreed to in writing,  
 \* software distributed under the License is distributed on an "AS IS" BASIS,  
 \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
 \* See the License for the specific language governing permissions and limitations under the License.  
 }

```

=====
*^next import './flags_wasm';

*^next import {registerBackend} from '@tensorflow/tfjs-core';

*^next import {BackendWasm, init} from './backend_wasm';

*^next {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';

*^next {version as version_wasm} from './version';

*^next const WASM_PRIORITY = 2;

*^next registerBackend('wasm', async () => {

 const {wasm} = await init();

 return new BackendWasm(wasm);

});

*^next WASM_PRIORITY);

*^next], "names": ["_FusedMatMul", "util", "Abs", "backend_util", "Add", "AddN", "Identity", "setup", "Transpose", "All", "Any", "wasmFunc", "ArgMax", "AvgPool", "Reshape", "BatchMatMul", "slice_util", "buffer", "sliceI

mplCPU", "Slice", "BatchToSpaceND", "Cast", "Ceil", "ClipByValue", "concatImplCPU", "Concat", "Conv2D", "Conv2

DBackpropInput", "Cos", "Cosh", "CropAndResize", "Cumsum", "DepthToSpace", "DepthwiseConv2dNative", "Elu", "s

upportsFullBroadcast", "Equal", "Exp", "ExpandDims", "Fill", "FlipLeftRight", "Floor", "FloorDiv", "FusedBatchNorm",

"FusedConv2D", "FusedDepthwiseConv2D", "GatherNd", "GatherV2", "Greater", "GreaterEqual", "setupFunc", "Leaky

Relu", "Less", "LessEqual", "Log", "LogicalAnd", "Max", "Maximum", "MaxPool", "Mean", "Min", "Minimum", "Mirror

Pad", "Multiply", "Neg", "NonMaxSuppressionV3", "NonMaxSuppressionV4", "NonMaxSuppressionV5", "kernelFunc",

"NotEqual", "OneHot", "OnesLike", "Pack", "PadV2", "Pow", "Prelu", "Prod", "rangeImplCPU", "Range", "RealDiv", "R

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"Softmax", "SpaceToBatchND", "SplitV", "Sqrt", "Square", "SquaredDifference", "Step", "StridedSlice", "Sub", "Sum",

"Tan", "Tanh", "Tile", "TopK", "Transform", "Unpack", "ZerosLike", "registerKernel", "env", "tslib_1.__extends", "DataS

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Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/miniprogram/index.js.map

No license file was found, but licenses were detected in source scan.



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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs});\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} =
attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n
util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n
util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n
intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n }\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n"}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pack.js.map

No license file was found, but licenses were detected in source scan.

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```

```
=====\n*\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Log.js.map
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```

```
=====\n*\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\ncreateBinaryKernelConfig(Pow, supportsFullBroadcast);\n"]}
```

Found in path(s):

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* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.js.map
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No license file was found, but licenses were detected in source scan.

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 C", "sourcesContent":["/\*\n \* @license\n \* Copyright 2021 Google LLC. All Rights Reserved.\n \* Licensed under  
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 License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \*\n \*  
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 on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
 implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the  
 License.\n \*

```

=====
*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from
 '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmTransform: (\n imageId:
 number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth:
 number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number)
 => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform,
 null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', //
 imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', //
 interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n
]);\n\n function transform(\n args:\n { backend: BackendWasm, inputs: TransformInputs, attrs:
 TransformAttrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { image, transforms } = inputs;\n
 const { interpolation, fillMode, fillValue, outputShape } = attrs;\n\n const [batch, imageHeight, imageWidth,
 numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :
 [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as
 [number, number, number, number];\n const strides =\n new Uint8Array(new
 Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out = backend.makeOutput(outShape,
 image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData =
 backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData =
 backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const
 interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case
 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n
 fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n
 break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,
 fillModeId, fillValue,\n outId);\n\n return out;\n }\n\n export const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as
 KernelFunc\n };
}

```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transform.js.map

No license file was found, but licenses were detected in source scan.

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=====\n *\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);"}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Multiply.js.map

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=====\n *\n\nimport { ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip =
```

```
backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', //
max\n 'number' // out_id\n]);\n\nfunction clip(args: {\n inputs: ClipByValueInputs,\n backend:
BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId,
clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as
KernelFunc\n};\n"]}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/ClipByValue.js.map
```

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 * =====
*/
/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 * the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
*/

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.es2017.js

```

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Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/parcel/index.html

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```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: { backend: BackendWasm, inputs: SigmoidInputs }):\n TensorInfo {\n const { backend, inputs: { x } } = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as { } as KernelFunc\n};\n\n}]
```



Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sigmoid.js.map

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*\nimport './flags_wasm';
*\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';
*\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';
*\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';
*\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';
// @ts-ignore
*\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';
*\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';
*\ninterface
TensorData {
 id: number;
 memoryOffset: number;
 shape: number[];
 dtype: DataType;
 refCount:
number;
 /** Only used for string tensors, storing encoded bytes. */
 stringBytes?: Uint8Array[];
}
*\nexport
type DataId = object; // object instead of {} to force non-primitive.
*\nexport class BackendWasm extends
KernelBackend {
 // 0 is reserved for null data ids.
 private dataIdNextNumber = 1;
 dataIdMap:
DataStorage<TensorData>;
 constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {
 super();
 this.wasm.tfjs.initWithThreadsCount(threadsCount);
 actualThreadsCount = this.wasm.tfjs.getThreadsCount();
 this.dataIdMap = new DataStorage(this, engine());
 }
 write(values: backend_util.BackendValues, shape:
number[], dtype: DataType): DataId {
 const dataId = {id: this.dataIdNextNumber++};
 this.move(dataId, values, shape, dtype, 1);
 return dataId;
 }
 numDataIds(): number {
 return
this.dataIdMap.numDataIds();
 }
 async time(f: () => void): Promise<BackendTimingInfo> {
 const start =
util.now();
 f();
 const kernelMs = util.now() - start;
 return {kernelMs};
 }
 move(dataId:
DataId, values: backend_util.BackendValues, shape: number[],
dtype: DataType, refCount: number): void {
 const id = this.dataIdNextNumber++;
 if (dtype === 'string') {
 const stringBytes = values as Uint8Array[];
 this.dataIdMap.set(
 dataId,
 {id, stringBytes, shape, dtype, memoryOffset: null, refCount});
 }
 return;
 }
 const size = util.sizeFromShape(shape);
 const numBytes = size *
util.bytesPerElement(dtype);
 const memoryOffset = this.wasm._malloc(numBytes);
 this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});
 this.wasm.tfjs.registerTensor(id, size,
memoryOffset);
 if (values != null) {
 this.wasm.HEAPU8.set(
 new Uint8Array(
 (values
as backend_util.TypedArray).buffer,
 (values as backend_util.TypedArray).byteOffset, numBytes),
 memoryOffset);
 }
 async read(dataId: DataId): Promise<backend_util.BackendValues> {
 return
this.readSync(dataId);
 }
 readSync(dataId: DataId): backend_util.BackendValues {
 const {memoryOffset,
dtype, shape, stringBytes} =
this.dataIdMap.get(dataId);
 if (dtype === 'string') {
 return stringBytes;
 }
 const bytes = this.wasm.HEAPU8.slice(
 memoryOffset,
 memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));
 return typedArrayFromBuffer(bytes.buffer, dtype);
 }
 /**
 * Dispose the memory if the dataId has 0 refCount. Return true if the memory
 * is released, false
 * otherwise.
 * @param dataId
 * @param force Optional, remove the data regardless of refCount
 */
 disposeData(dataId: DataId, force = false): boolean {
 if (this.dataIdMap.has(dataId)) {
 const data =
this.dataIdMap.get(dataId);
 data.refCount--;
 if (!force && data.refCount > 0) {
 return false;
 }
 this.wasm._free(data.memoryOffset);
 this.wasm.tfjs.disposeData(data.id);
 this.dataIdMap.delete(dataId);
 }
 return true;
 }
 /** Return refCount of a `TensorData`. */
 refCount(dataId: DataId): number {
 if (this.dataIdMap.has(dataId)) {
 const tensorData =
this.dataIdMap.get(dataId);
 return tensorData.refCount;
 }
 return 0;
 }
 incRef(dataId: DataId) {
 const data = this.dataIdMap.get(dataId);
 if (data != null) {
 data.refCount++;
 }
 }
 floatPrecision():
32 {
 return 32;
 }
 // Returns the memory offset of a tensor. Useful for debugging and unit
 // testing.
 getMemoryOffset(dataId: DataId): number {
 return this.dataIdMap.get(dataId).memoryOffset;
 }
 dispose() {
 this.wasm.tfjs.dispose();
 if ('PThread' in this.wasm) {
 this.wasm.PThread.terminateAllThreads();
 }
 this.wasm = null;
 }
 memory() {
 return {unreliable:
false};
 }
 /**
 * Make a tensor info for the output of an op. If `memoryOffset` is not
 * present, this
 * method allocates memory on the WASM heap. If `memoryOffset`
 * is present, the memory was allocated
 * elsewhere (in c++) and we just record
 * the pointer where that memory lives.
 */
 makeOutput(shape:
number[], dtype: DataType, memoryOffset?: number): TensorInfo {
 let dataId: {};
 if (memoryOffset

```



```

null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob(\n [\n var WasmBackendModuleThreadedSimd = `
+\n wasmFactoryThreadedSimd.toString()),\n {type: 'text/javascript'});\n wasm =
wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD
binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully
created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =
null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:
module.cwrap('init', null, []),\n initWithThreadCount:\n module.cwrap('init_with_threads_count', null,
['number']),\n getThreadCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:
module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n resolve({wasm: module});\n });\n });\n\n function typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case
'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n\n const wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm',
'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n type
WasmBinaryName = typeof wasmBinaryNames[number];\n\n let wasmPath: string = null;\n let wasmPathPrefix:
string = null;\n let wasmFileMap: {[key in WasmBinaryName]?: string} = {};\n let initAborted = false;\n let
customFetch = false;\n\n /**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n */\n /**\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\n export function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and ' +\n ' will be removed in a future release.);\n if
(initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n ' `setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`);\n }\n wasmPath = path;\n customFetch =
usePlatformFetch;\n }\n\n /**\n * Configures the locations of the WASM binaries.\n */\n /**\n * @js\n */\n setWasmPaths({\n 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n });\n\n /**\n * tf.setBackend('wasm');\n */\n /**\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n */\n /**\n * @doc {heading:
'Environment', namespace: 'wasm'}\n */\n export function setWasmPaths(\n prefixOrFileMap: string | {[key in
WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n ' `setWasmPaths()` before you call
`tf.setBackend()` or ' +\n ' `tf.ready()`);\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix
= prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new
Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}`. Please
either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n }\n\n /**\n * Used in unit tests.\n */\n export function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n }\n\n let threadsCount = -1;\n let

```

```
actualThreadsCount = -1;\n\n**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n * This must be called before calling\n * tf.setBackend('wasm')\n * export function setThreadsCount(numThreads: number) {\n * threadsCount =\n * numThreads;\n * }\n\n**\n * Gets the actual threads count that is used by XNNPACK.\n * It is set after the\n * backend is initialized.\n * export function getThreadsCount(): number {\n * if (actualThreadsCount === -1) {\n * throw new Error('WASM backend not initialized.);\n * }\n * return actualThreadsCount;\n * }\n\n
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Rsqrt.js","sourceRoot":"","sources":["../../src/kernels/Rsqrt.ts"],"names":[],"mappings":"AAAA;:::;;GAG;AACH,OAAO,EA Ae,KA AK,EA AC,MA AM,uBA AuB,CA AC;AA EID,OAAO,EA AC,uBA AuB,EA AC,MA AM,gBA AgB,CA AC;AA CvD,MA AM,CA AC,MA AM,WA AW,GA AiB,uBA AuB,CA AC,KA AK,CA AC,CA AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n * import {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n * import {createUnaryKernelConfig} from './unary_kernel';\n * export const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n *]\n\n
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Rsqrt.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Less.js","sourceRoot":"","sources":["../../src/kernels/Less.ts"],"names":[],"mappings":"AAAA;:::;;GAG;AACH,OAAO,EA Ae,IA AI,EA AC,MA AM,uBA AuB,CA AC;AA EzD,OAAO,EA AC,wBA AwB,EA AC,MA AM,iBA AiB,CA AC;AA CzD,MA AM,qBA AqB,GA AG,KA AK,CA AC;AA CpC,MA AM,CA AC,MA AM,U AA U,GACnB,wBA AwB,CA AC,IA AI,EA AE,qBA AqB,EA AE,MA AM,CA AC,CA AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n * import {KernelConfig, Less} from '@tensorflow/tfjs-core';\n * import {createBinaryKernelConfig} from './binary_kernel';\n * const supportsFullBroadcast = false;\n * export const lessConfig: KernelConfig =\n * createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n *]\n\n
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
```

wasm/dist/kernels/LeakyRelu.js.map

No license file was found, but licenses were detected in source scan.

```

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s":"AAAA;,,,,,;GAeG;AAEH,OAAO,EAA2B,SAAS,EAA+C,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAI7H,
OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,IAAI,QAC0E,CAAC;AAE/E,SAAS,SAAS,CAAC,O
AAoB;IACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,SAAS,EAAE,IAAI,CAAC,UAAU,EAAE
;QACxD,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;KACT,CAAC,CAAC;AACL,CAAC;AAED,MAA
M,UAAU,SAAS,CACrB,IAC0E;IAE5E,MAAM,EAAC,MAAM,EAAE,EAAC,CAAC,EAAC,EAAE,KAAK,EAA
E,EAAC,KAAK,EAAC,EAAE,OAAO,EAAC,GAAG,IAAI,CAAC;IAEpD,MAAM,GAAG,GAAG,OAAO,CAAC,
SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,8EAA8E;IAC9E,YAA
Y;IACZ,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAK,EAAE,SAAS,CAAC,CAAC;IA
EnD,IAAI,IAAI,CAAC,aAAa,CAAC,CAAC,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;QACrC,MAAM,KAAK,
GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACnD,
QAAQ,CAAC,GAAG,EAAE,QAAQ,CAAC,CAAC,CAAC,KAAK,CAAC,EAAE,KAAK,EAAE,KAAK,CAAC,C
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AAU,EAAE,SAAS;IACrB,WAAW,EAAE,MAAM;IACnB,SAAS;IACT,UAAU,EAAE,SAA6B;CAC1C,CAAC",
sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
\n
*/\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from
'./types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
out_id\n]);\n\n export function leakyRelu(\n args: {\n inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
backend: BackendWasm});\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either
float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
!== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n }\n\n return out;\n }\n\n export const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n };
\n"}]

```

Found in path(s):

```

* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/LeakyRelu.js.map

```

No license file was found, but licenses were detected in source scan.

```

{"version":3,"file":"BatchMatMul.js","sourceRoot":"","sources":["../../src/kernels/BatchMatMul.ts"],"names":[],"ma
ppings":"AAAA;,,,,,;GAeG;AAEH,OAAO,EAAC,WAAW,EAAiE,IAAI,EAAC,MAAM,uBAAuB,CAAC;A
AIvH,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AAEiC,IAAI,eAG2C,CAAC;AAEhD,SAAS,KAAK,
CAAC,OAAoB;IACjC,eAAe,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,WAAW,EAAE,IAAI,CAAC,UA
AU,EAAE;QACjE,QAAQ;QACR,OAAO;QACP,QAAQ;QACR,QAAQ;QACR,OAAO;QACP,QAAQ;QACR,QA

```



AQ;QACR,QAAQ;QACR,QAAQ,CAAG,SAAS;KACrB,CAAC,CAAC;AACL,CAAC;AAED,SAAS,WAAW,CAAC,IAIpB;IACC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAC,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,CAAC,EAAE,CAAC,EAAC,GAAG,MAAM,CAAC;IACtB,MAAM,EAAC,UAAU,EAAE,UAAU,EAAE,CAAC,GAAG,KAAC,CAAC;IAEvC,IAAI,CAAC,CAAC,KAAC,KAAC,SAAS,IAAI,CAAC,CAAC,KAAC,KAAC,SAAS,EAAE;QACID,MAAM,IAAI,KAAC,CACX,4DAA4D,CAAC,CAAC;KACnE;IAED,MAAM,KAAC,GAAG,CAAC,CAAC,KAAC,CAAC,MAAM,CAAC;IAC7B,MAAM,KAAC,GAAG,CAAC,CAAC,KAAC,CAAC,MAAM,CAAC;IAE7B,MAAM,WAAW,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC;IACzE,MAAM,WAAW,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC;IAEzE,MAAM,WAAW,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC;IACzE,MAAM,WAAW,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,GAAG,CAAC,CAAC,CAAC;IAEzE,MAAM,UAAU,GAAG,CAAC,CAAC,KAAC,CAAC,KAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;IACxC,MAAM,UAAU,GAAG,CAAC,CAAC,KAAC,CAAC,KAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;IAExC,MAAM,SAAS,GAAG,IAAI,CAAC,aAAa,CAAC,UAAU,CAAC,CAAC;IACjD,MAAM,SAAS,GAAG,IAAI,CAAC,aAAa,CAAC,UAAU,CAAC,CAAC;IAEjD,MAAM,mBAAmB,GACrB,SAAS,KAAC,SAAS,IAAI,SAAS,KAAC,CAAC,IAAI,SAAS,KAAC,CAAC,CAAC;IAEIE,IAAI,CAAC,MAAM,CACP,KAAC,IAAI,CAAC,IAAI,KAAC,IAAI,CAAC,IAAI,mBAAmB,EAC/C,GAAG,EAAE,CAAC,iEAAiE;QACnE,kEAAkE;QACIE,wBAAwB,UAAU,UAAU,UAAU,IAAI,CAAC,CAAC;IAEpE,MAAM,iBAAiB,GACnB,SAAS,GAAG,SAAS,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAC,CAAC,KAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC;IACxE,MAAM,QAAQ,GAAG,iBAAiB,CAAC,MAAM,CAAC,CAAC,WAAW,EAAE,WAAW,CAAC,CAAC,CAAC;IAEtE,IAAI,CAAC,MAAM,CACP,WAAW,KAAC,WAAW,EAC3B,GAAG,EAAE,CAAC,kCAAkC,WAAW,SAAS;QACxD,GAAG,WAAW,4BAA4B,CAAC,CAAC,KAAC,OAAO;QACxD,GAAG,CAAC,CAAC,KAAC,mBAAmB,UAAU,EAAE;QACzC,mBAAmB,UAAU,cAAc,CAAC,CAAC;IAErD,MAAM,QAAQ,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,SAAS,EAAE,WAAW,EAAE,WAAW,CAAC,CAAC,CAAC;QACvC,CAAC,SAAS,EAAE,WAAW,EAAE,WAAW,CAAC,CAAC;IACpE,MAAM,QAAQ,GAAG,UAAU,CAAC,CAAC,CAAC,CAAC,SAAS,EAAE,WAAW,EAAE,WAAW,CAAC,CAAC,CAAC;QACvC,CAAC,SAAS,EAAE,WAAW,EAAE,WAAW,CAAC,CAAC;IAEpE,0EAA0E;IACIE,MAAM,GAAG,GAAG,OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE,CAAC,EAAC,EAAE,OAAO,EAAE,KAAC,EAAE,EAAC,KAAC,EAAE,QAAQ,EAAC,EAAC,CAAC,CAAC;IACzE,MAAM,GAAG,GAAG,OAAO,CAAC,EAAC,MAAM,EAAE,EAAC,CAAC,EAAE,CAAC,EAAC,EAAE,OAAO,EAAE,KAAC,EAAE,EAAC,KAAC,EAAE,QAAQ,EAAC,EAAC,CAAC,CAAC;IAEzE,MAAM,KAAC,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IACnD,MAAM,KAAC,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAEnD,MAAM,OAAO,GAAG,UAAU,CAAC,CAAC,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,CAAC,CAAC;IACzD,MAAM,QAAQ,GAAG,UAAU,CAAC,CAAC,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,CAAC;IACID,MAAM,QAAQ,GAAG,IAAI,CAAC,GAAG,CAAC,SAAS,EAAE,SAAS,CAAC,CAAC;IAEhD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,CAAC,QAAQ,EAAE,OAAO,EAAE,QAAQ,CAAC,EAAE,GAAG,CAAC,KAAC,CAAC,CAAC;IACzE,MAAM,KAAC,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAEnD,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,MAAM,CAAC,CAAC;IACrE,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,GAAG,CAAC,KAAC,CAAC,CAAC,MAAM,CAAC,CAAC;IAErE,eAAe,CACX,KAAC,EAAE,WAAW,EAAE,GAAG,CAAC,KAAC,CAAC,MAAM,EAAE,KAAC,EAAE,WAAW,EACxD,GAAG,CAAC,KAAC,CAAC,MAAM,EAAE,UAAU,EAAE,UAAU,EAAE,KAAC,CAAC,CAAC;IAErD,OAAO,CAAC,WAAW,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;IAChC,OAAO,CAAC,WAAW,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;IAEhC,GAAG,CAAC,

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AAU,EAAE,WAA+B;CAC5C,CAAC", "sourcesContent":["/\*\*\n \* @license\n \* Copyright 2019 Google LLC. All  
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```
*\n\nimport { BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util } from
'@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { reshape } from
 './Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
 null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n\n function batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n }) {\n const { inputs, backend, attrs } = args;\n const { a, b } = inputs;\n const { transposeA, transposeB } = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions must either be the same or at least one input batch dimension must be 1. Got input batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape =\n outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and (${innerShapeB}) of Tensors with shapes ${a.shape} and ${b.shape} and transposeA=${transposeA} and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] : [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] : [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation is designed to operate on rank-3 tensors\n const a3d = reshape({ inputs: { x: a }, backend, attrs: { shape: a3dShape }});\n const b3d = reshape({ inputs: { x: b }, backend, attrs: { shape: b3dShape }});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n }\n\n export const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
```

batchMatMul as {} as KernelFunc\n};\n"]}

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchMatMul.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"tf-backend-wasm.fesm.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../src/version.ts","../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,\n * either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n * This enum must align with the enum defined in cc/backend.h.\n * export enum CppDType {\n * float32 = 0,\n * int32 = 1,\n * bool = 2,\n * string = 3,\n * complex64 = 4\n * }\n * Must match enum in cc/fusable_activations.h.\n * export enum FusableActivation {\n * linear = 0,\n * relu = 1,\n * relu6 = 2,\n * prelu = 3,\n * leakyrelu = 4,\n * sigmoid = 5,\n * elu
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```
=====\n*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { FusableActivation } from './types';\n\nlet wasmFusedMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number, bShape: Uint8Array, bShapeSize: number, transposeA: boolean, transposeB: boolean, activation: number, biasId: number, preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) => \n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number' // out_id\n]);\n\n function fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs, backend: BackendWasm, attrs: _FusedMatMulAttrs\n }) {\n const { inputs, backend, attrs } = args;\n const { a, b, bias, preluActivationWeights } = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(`_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(`_FusedMatMul only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 : backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n\n if (fusedActivation == null) {\n throw new Error(`${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length, transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n }\n\n export const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul, backendName: 'wasm',\n setupFunc: setup, kernelFunc: fusedBatchMatMul as {} as KernelFunc\n }; \n}\n\n/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport { DataType, KernelConfig, TensorInfo, UnaryInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { CppDType } from './types';\n\nexport function createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n
```

```

wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs});\n\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const\n out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm',\n setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from\n './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-\n core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nexport\n function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:\n DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:\n number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /*\n void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs});\n\n TensorInfo {\n const {backend,\n inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId =\n backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape =\n backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape,\n outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return\n out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes =\n new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if\n (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n\n const\n aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims =\n backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) =>\n v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA &&\n loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting\n along outer dims is not yet\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return\n {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"/**\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not

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software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport\n {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmFunc:\n (inputIds:\n Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend:\n BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n\nfunction addn(args: {inputs:\n TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out =\n backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if\n (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x =>\n backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length,\n CCppType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName:\n AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport\n {TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nexport function\n identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =\n args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const\n identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as\n KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n
*\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {identity} from
 './Identity';\n\nimport {CppType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array,
 xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) =>
 void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /*
 void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n\n \n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs};\n TensorInfo {\n const {inputs,
 backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better
 due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape,
 attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n
 permIsNoOp = false;\n }\n }\n\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n
 dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const
 cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out =
 backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =
 backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const
 xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId,
 xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return
 out;\n }\n\n \n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new
 Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n
 return outShape;\n }\n\n \n\nfunction removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]]
 {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if
 (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n
 newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for
 (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i &&\n (minValIdx === -1 || newPerm[minValIdx] >
 newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape,
 newPerm];\n }\n\n \n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName:
 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n };\n\n /**\n * @license\n * Copyright
 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
 you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
 http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n *
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n */
 }\n\n \n\n=====\n
*\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
 './backend_wasm';\n\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
 if necessary.\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
 @param backend wasm backend instance\n */\n\nexport function permuteAxesAndTranspose(\n x: TensorInfo,
 axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes:
 number[],\n inputWasTransposed: boolean\n } {\n const xShape = x.shape;\n const xRank =
 x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const
 permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let
 inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n
 for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n axes =
 backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: {x}, attrs: {perm:
 permutedAxes}, backend});\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId =
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backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n", "/\*\n \* @license\n \* Copyright 2021 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the\n \* \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the\n \* License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or\n \* agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for\n \* the specific language governing permissions and\n \* limitations under the License.\n \*  
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\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nlet wasmAll: (xId: number, reduceSize: number, outId:\n number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null\n /*void*/, [number, number, number]);\n}\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs:\n AllAttrs}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}\n = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const\n {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if\n (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input =\n transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: all as { } as KernelFunc;\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport\n {permuteAxesAndTranspose} from './kernel_utils';\nlet wasmAny: (xId: number, reduceSize: number, outId:\n number) => void;\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,\n null /*void*/, [number, number, number]);\n}\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,\n attrs: AnyAttrs}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}\n = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const\n {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis,\n backend);\n\n if\n (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input =\n transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =\n util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
```



```
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: any as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util } from '@tensorflow/tfjs-\n core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from\n './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:\n number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n\n function argmax(\n args:\n { inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs }) {\n const { backend, inputs, attrs } = args;\n const { axis } = attrs as {} as ArgMaxAttrs;\n const { x } = inputs as {} as ArgMaxInputs;\n const xId =\n backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes,\n inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose\n was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =\n transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out =\n backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize =\n util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId,\n CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the\n transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n }\n\n export const\n argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n };\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

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=====\n\n*/\n\nimport { AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmAvgPool: (\n xId:\n number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:\n number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n\n function
```

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avgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,
backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const
padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n
const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n
`wasm backend does not support dataFormat: " +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n
}\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend
only supports average pooling with dilation = [1, 1],` +\n `got [${convInfo.dilationHeight},
${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n
outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as { } as KernelFunc\n};\n"/**\n * @license\n
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"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nexport function reshape(\n args: {inputs:
ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} =
inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape =
util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () =>
`new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of
elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n
return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n
kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as { } as KernelFunc\n};\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {reshape} from
'./Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul,
null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n
'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n
'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend:
BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n

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const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions must either be the same or at least one input batch dimension must be 1. Got input batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n\n const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and (${innerShapeB}) of Tensors with shapes ${a.shape} and ${b.shape} and transposeA=${transposeA} and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] : [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] : [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n}\n\nexport const batchMatMulConfig:\n KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\n *import { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n outVals.set(input.vals, offset);\n offset += size;\n });\n } else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n colOffset += input.shape[1];\n }\n });\n }\n return outVals;\n}\n\n#\nsourceMappingURL=data:application/json;base64,eyJ2ZXJzaW9uIjozLCJmaWxjoiQ29uY2F0X2ltcGwuanMiLC

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BQU8sRUFbQyxZQUFZLEVBQWICLE1BQU0sRUFbc0MsS0FBSyxFUUFFLVbQVUsRUFbUQsSUFBSsx  
FUFDLE1BQU0sdUJBQXVCLenBQUM7QUFHeEwsT0FBTyxFQUFDLGDcQUFnQixFUFDLE1BQU0sYU  
FBYsxDQUFD00FBRTdDLE1BQU0sVUFbVSxtQUFTLENBQ3JCLEIBQW1CLEVBQUUsS0FBZsxFUUFFL  
EIBQWMsRUFBRsxLQUFILEVBQ3JFLEtBQUW7SUFdaKIsTUFbTSxXQUFXLEdBQUcsVUFbVSxDQUFDL  
GDcQUFnQixDQUFDLEtBQUssRUFBRsxLQUFLLEVBQUUsSUFBSsxDQUFDLENBQUM7SUFdcEUstUFb  
TSxNQFNLEdBQUcsSUFBSsxDQUFDLGFbQWEsQ0FBQyxJQUFJLENBQUMsQ0FBQztJQUN4QyxNQUF  
NLFFBQVEsR0FBRyxJQUFJLENBQUMsY0FBYyxDQUFDLEtBQUssQ0FBQyxDQUFD00IBRTVDLEIBQUks  
V0FBVyxFUUFF01FBQ2YstUFbTSxVQUFVLEdBQUcsVUFbVSxDQUFDLGCQUFpQixDQUFDLEtBQUss  
RUFBRsxRQUFRLENBQUMsQ0FBQztRQUVqRSxJQUFJLEtBQUssS0FBSyxRQUFRLEVBQUU7WUFDdEIs  
T0FBUSxJQUFQixDQUFDLEtBQUssQ0FBQyxVQUFVLEVBQUUsVUFbVSxHQUFHLE1BQU0sQ0FBQyxD  
QUFD01NBQ3RFO1FBRUQsT0FBUSxJQUFtQixDQUFDLFFBQVEsQ0FBQyxVQUFVLEVBQUUsVUFbVSx  
HQUFHLE1BQU0sQ0FBQyxDQUFD00tBQ3ZFO0IBRUQsTUFbTSxXQUFXLEdBQUcsS0FBSyxLQUFLFFB  
QVEsQ0FBQyxDQUFD01FBQ3BDLFIBQVksQ0FBQyxzkFBc0IsQ0FBQyxJQUFvQixDQUFDLENBQUMsQ  
0FBQztRQUMzRCxJQUFrQixDQUFD00IBRXZCLE1BQU0sS0FBSyxHQUFHLE1BQU0sQ0FBQyxLQUFLE  
VBQUUsS0FBSyxFUUFFLFdBQVcsQ0FBQyxDQUFD00IBQ2HELE1BQU0sTUFbTSxHQUFHLE1BQU0sQ0F  
BQyxJQUFJLEVBQUUsS0FBSyxDQUFDLENBQUM7SUFDbkMsS0FBSyxJQUFJLENBQUMsR0FBRyxDQUF  
DLEVBQUUsQ0FBQyxHQUFHLE1BQU0sQ0FBQyxJQUFJLEVBQUUsRUFBRsxDQUFDLEVBQUU7UUFdc  
EMstUFbTSxNQFNLEdBQUcsTUFbTSxDQUFDLFVBQVUsQ0FBQyxDQUFDLENBQUMsQ0FBQztRQU  
wQyxNQFNLEtBQUssR0FBRyxNQFNLENBQUMsR0FBRyxDQUFDLENBQUMsR0FBVyxFUUFFLENBQ  
UMsRUFBRsxFUUFFLENBQUMsR0FBRyxHQUFHLEtBQUssQ0FBQyxDQUFDLENBQUMsQ0FBQyxDQUF  
DO1FBQzdELE1BQU0sQ0FBQyxHQUFHLENBQUMsS0FBSyxDQUFDLEdBQUcsQ0FBQyxHQUFHLEtBQU  
sQ0FBQyxFUUFFLEdBQUcsTUFbTSxDQUFDLENBQUM7S0FDNUM7SUFFRCxJQUFJLEtBQUssS0FBSyxR  
QUFRLEVBQUU7UUFdDEIsT0FBTyxZQUFZLENBQUMsc0JBQXNCLenBQUMstUFbTSxDQUFDLE1BQ  
WtCLenBQUMsQ0FBQztLQUN2RTtJQUNELE9BQU8stUFbTSxDQUFDLE1BQW9CLenBQUM7QUFDcK  
sQ0FBQztBQUVELE1BQU0sVUFbVSxLQUFLENBQ2pCLEIBQXVFO0IBRXpFLE1BQU0sRUFbQyxNQFN  
NLEVBQUUsT0FBTyxFUUFFLEtBQUssRUFbQyxHQUFHLEIBQUksQ0FBQztJQUN0QyxNQFNLEVBQUM  
sQ0FBQyxFUFDLEdBQUcsTUFbTSxDQUFD00IBQ25CLE1BQU0sRUFbQyxLQUFLEVBQUUsSUFBSsx  
FUFDLEdBQUcsS0FBSyxDQUFD00IBRTVCLGDcQUFnQixDQUFDLENBQUMsRUFBRsxPQUFPLENBQ  
UMsQ0FBQztJQUU3QixNQFNLENBQUMstUFbTSxFUUFFLEtBQUssQ0FBQyxHQUFHLFVBQVUsQ0FB  
QyxnQkFBZ0IsQ0FBQyxDQUFDLEVBQUUsS0FBSyxFUUFFLEIBQUksQ0FBQyxDQUFD00IBQ3BFLFVBQ  
VUsQ0FBQyxpkFBaUIsQ0FBQyxDQUFDLEVBQUUsTUFbTSxFUUFFLEtBQUssQ0FBQyxDQUFD00IBRS  
9DLE1BQU0sSUFBSsxHQUFHLE9BQU8sQ0FBQyxJQUFJLENBQUMsR0FBRyxDQUFDLENBQUMsQ0FBQ  
yxNQFNLENBQUMsQ0FBQyxNQFNLENBQUM7SUFDL0MstUFbTSxPQUFPLEdBQUcsU0FBYyxDQUF  
DLEIBQUksRUFBRsxNQFNLEVBQUUsS0FBSyxFUUFFLENBQUMsQ0FBQyxLQUFLEVBQUUsQ0FBQy  
xDQUFDLEtBQUssQ0FBQyxDQUFD00IBQ2pFLE9BQU8st0FBTyxDQUFDLGNBQWMsQ0FBQyxLQUFLE  
VBQUUsQ0FBQyxDQUFDLEtBQUssRUFBRsxPQUFPLENBQUMsQ0FBQztBQUN6RCxDQUFD00FBRUQsT  
UFbTSxDQUFDLE1BQU0sV0FBVyxHQUFpQjtJQUN2QyxVQUFVLEVBQUUsS0FBSztJQUNqQixXQUFXLE  
VBQUUsS0FBSztJQUNsQixVQUFVLEVBQUUsS0FBeUI7Q0FDdEMsQ0FBQyIsInNvdXJjZXNDb250ZW50Ijpp  
bGli8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEVdb2dsZSBMTEMuIEFsbCBSaWdodHMgUm  
VzZXJ2ZWQuXG4gKiBMaWNIbnNIZCB1bmRlciB0aGUgQXBhY2h1IEpY2Vuc2UuIFZlcnNpb24gMi4wICh0a  
GUgXCJMawNIbnNIXCIpO1xuICogeW91IG1heSBub3QgdXNIIHRoaXMgZmlsZSBleGNlcHQgaW4gY29tcGxp  
YW5jZSB3aXR0IHRoZSBMaWNIbnNlI1xuICogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNIb  
nNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxuIC  
ogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgbGF3IG9yIGFnemVIZCB0byBpbjB3cmI0aW5nLCBzb2  
Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIEpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4g  
XCJBUyBjU1w1IEJBU0ItLFxuICogV0lUSE9VVCBxQVJSQU5USUVTIE9SIENPTkRJEIPTImgT0YgQU5Z  
EtJTkQsIGVpdGhlciBleHByZXNzIG9yIGltcGxpZWQuXG4gKiBTZWUgdGhlIEpY2Vuc2UgZm9yIHRoZSBz  
GVjaWZpYyBsYW5ndWFbnZSBnb3Zlcm5pbmcgcGVyYWwzZW50bWVzZW50bWVzZW50bWVzZW50bWVzZW50bWVz





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slice_util.parseSliceParams(x, begin, size);\n\n const isContinuous = slice_util.isSliceContinuous(x.shape, begin_,
size_);\n const xVals = backend.readSync(x.dataId);\n const out = backend.makeOutput(size_, x.dtype);\n const
xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinuous)
{\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n
outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset +
util.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset +
util.sizeFromShape(size_));\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res =
sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return
out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2)
{\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as
[number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1],
outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4)
{\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number,
number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return
out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals:
backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n
const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI;
i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]),
outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1:
number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size:
[number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i <
endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n
outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3:
number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number,
number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n
const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK
+ size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++)
{\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 +
beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n
}\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n
kernelFunc: slice as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n\n*\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{reshape} from './Reshape';\n\nimport {slice} from './Slice';\n\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape,
crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped =

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backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n
backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return
result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n
backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm});\n TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n
return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n
kernelFunc: cast as {} as KernelFunc,\n};\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:
number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip =
backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', //
max\n 'number' // out_id\n]);\n\n function clip(args: {\n inputs: ClipByValueInputs,\n backend:
BackendWasm,\n attrs: ClipByValueAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n

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const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =
backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId,
clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n
kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concatImplCPU} from
'./kernel_utils/shared';\n\nimport {identity} from './identity';\n\nimport {reshape} from './Reshape';\n\nexport function
concat(\n args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend}
= args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape =
backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors
with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length ====
1) {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape,
inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n\n const shapes =
$inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype ====
'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-
dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors\n // into a two-dimensional tensor by
collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n
// the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize =
util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t},
backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals:
backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concat 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat =
inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape,\n inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const
outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes =
backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims =
0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n
sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input =>
backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b <
batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const
innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset,
inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return
out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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=====\n*\n\nimport { backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\n function conv2d(\n args: { inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs }) {\n const { inputs, attrs, backend } = args;\n const { x, filter } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const { strides, dilations, pad, dimRoundingMode, dataFormat } = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat: "${convInfo.dataFormat}". Please use 'channelsLast'.`);\n }\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n }\n\n export const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as { } as KernelFunc;\n };\n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number, filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number, strideHeight: number, strideWidth: number,\n topPad: number, leftPad: number, fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n
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=====
*\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n"/**\n *
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {cast}
from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest
= 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes:
number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,
extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
 wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n
 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n
 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n
 'number', // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n
 attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method,
 extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n const numBoxes =
 boxes.shape[0];\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape =
 [numBoxes, cropHeight, cropWidth, image.shape[3]];\n let imagesData =
 backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData =
 cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData =
 backend.dataIdMap.get(castedData.dataId);\n }\n const imagesId = imagesData.id;\n const boxesId =
 backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n const
 out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
 imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n wasmCropAndResize(\n
 imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n
 InterpolationMethod[method as {}] as keyof typeof InterpolationMethod,\n extrapolationValue, outId);\n if
 (castedData !== null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n}\n\nexport const
 cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc:
 setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from
'./types';\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n finalDim: number, outId: number, dtype: CCppType) => void;\n\nfunction setup(backend:
BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n
 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n
]);\n}

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dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs});\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis,
exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype ===
'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis
to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n const permutedOut =
backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out =
permutedOut;\n if (permutation !== null) {\n const undoPermutation =
backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs:
{perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n }\n backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig =
{\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n
'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n
'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs:
DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight
= (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ?
x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const
outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth =
inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize,
outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const
out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const
xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new
Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new
Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast,
xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return
out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName:

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'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as { } as KernelFunc\n);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
=====
\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,\nDepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\nimport\n{BackendWasm} from './backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number,\n inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop:\n number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight:\n number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number,\n outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null / void */, [\n 'number', //\n xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', //\n filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', //\n padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //\n dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n\n function\n depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs:\n DepthwiseConv2dNativeAttrs\n }) {\n const {inputs, attrs, backend} = args;\n const {x, filter} = inputs;\n const\n xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n const\n {strides, dilations, pad, dimRoundingMode} = attrs;\n const $dilations = dilations === null ? [1, 1] : dilations;\n const\n convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape,\n strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n const\n filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const\n padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const\n padBottom = convInfo.padInfo.bottom;\n const\n padLeft = convInfo.padInfo.left;\n const\n dilationHeight = convInfo.dilationHeight;\n const\n dilationWidth = convInfo.dilationWidth;\n const\n strideHeight = convInfo.strideHeight;\n const\n strideWidth = convInfo.strideWidth;\n const\n inputChannels = convInfo.inChannels;\n const\n outputChannels = convInfo.outChannels;\n const\n isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n if\n (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative\n does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n const\n out = backend.makeOutput(convInfo.outShape, 'float32');\n const\n outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth,\n padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth,\n inputChannels,\n outputChannels, outId);\n return out;\n }\n\n export const\n depthwiseConv2dNativeConfig:\n KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as { } as KernelFunc\n);\n\n "/*\n * @license\n * Copyright 2021 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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*\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank\n }]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {\n attrs: FillAttrs,\n backend: BackendWasm\n}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out =
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backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as\n number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName:\n 'wasm',\n kernelFunc: fill as { } as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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\n*\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-\ncore';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch:\n number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,\n null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //\n imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =\n backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,\n imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,\n imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:\n KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as { } as\n KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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\n*\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n", "/*\n *\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
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\n*\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n", "/*\n *\n * @license\n * Copyright 2019 Google\n LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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*\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number',
'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName:
FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */
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*\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d: (\n xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number,
padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number,
dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', //
batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //
filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n
'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n
'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //
preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction
fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n})
{\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n
strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } =
attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as
Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n
throw new Error(\n `${activation} activation not yet supported for FusedConv2D` +\n ` in the wasm backend.`);\n
}\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId =
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backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n\n (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank\n ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels\n (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n\n const\n filterWidth = convInfo.filterWidth;\n\n const padTop = convInfo.padInfo.top;\n\n const padRight =\n convInfo.padInfo.right;\n\n const padBottom = convInfo.padInfo.bottom;\n\n const padLeft = convInfo.padInfo.left;\n\n const dilationHeight = convInfo.dilationHeight;\n\n const dilationWidth = convInfo.dilationWidth;\n\n const\n strideHeight = convInfo.strideHeight;\n\n const strideWidth = convInfo.strideWidth;\n\n const inputChannels =\n convInfo.inChannels;\n\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n const batchSize =\n convInfo.batchSize;\n\n const inHeight = convInfo.inHeight;\n\n const inWidth = convInfo.inWidth;\n\n\n if\n (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support\n dataFormat:` +\n ` ${dataFormat}`. Please use 'NHWC'.`);\n }\n\n\n const out =\n backend.makeOutput(convInfo.outShape, 'float32');\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const\n preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n\n wasmFusedConv2d(\n xId, batchSize, inHeight,\n inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation,\n preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n\n return out;\n}\n\n\nexport const fusedConv2DConfig:\n KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:\n fusedConv2d as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n =====\n\n *\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,\n FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport\n {BackendWasm} from './backend_wasm';\n\n\nimport {FusableActivation} from './types';\n\n\nlet\n wasmFusedDepthwiseConv2d:\n (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight:\n number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:\n number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number\n) =>\n void;\n\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', //\n batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //\n filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', //\n padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', //\n dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', //\n preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n\n\nfunction\n fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs:\n FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias,\n preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
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dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo =
backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as { }
as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `_${activation}
activation not yet supported for FusedDepthwiseConv2D` +\n `in the wasm backend.`);\n }\n\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const
outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData =
backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n
if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n
biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth =
convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const
padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight =
convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight =
convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =
convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize =
convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if
(dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support
dataFormat:` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize,
inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as { } as KernelFunc\n};\n\n"/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from './types';\n\nlet
wasmGatherNd: (\n xId: number, dtype: CCppType, indicesId: number, numSlices: number,\n sliceRank:
number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n
'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', //
sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm,
inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} =
inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params,
indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return
out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n
const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new

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Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes,\n outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n\n", "/*\n * @license\n * Copyright 2019\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
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*\n\nimport { backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor,\n TensorInfo, TypedArray, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from\n './backend_wasm';\n\nimport { reshape } from './Reshape';\n\nimport { CppDType } from './types';\n\nlet wasmGather:\n (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize:\n number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array',\n // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', //\n outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: { backend: BackendWasm, inputs:\n GatherV2Inputs, attrs: GatherV2Attrs }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { x,\n indices } = inputs;\n const { axis, batchDims } = attrs;\n\n // Throw error when any index is out of bound.\n const\n parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as\n TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index\n = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>`\n `GatherV2: the\n index value ${index} is not in [0, ${axisDim - 1}]);\n }\n\n const shapeInfo =\n backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis,\n batchDims);\n\n const flattenX = reshape({\n inputs: { x },\n attrs: {\n shape: [\n shapeInfo.batchSize,\n shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const\n indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: { x: indices },\n attrs:\n { shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize] },\n backend\n });\n const flattenOutputShape =\n [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData =\n backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData =\n backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new\n Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new\n Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype],\n xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape =\n shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName:\n GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as { } as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *\n

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*\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
```

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=====\n
*\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
 from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
 may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {CppType} from
 './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) =>
 void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu,
 null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', //
 out_id\n]);\n}\n\nexport function leakyRelu(\n args: {\n inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
 backend: BackendWasm});\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId =
 backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either
 float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
 !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CCppType[x.dtype], alpha,
 outId);\n }\n\n return out;\n }\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n"/**\n * @license\n *
 Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
 "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
 License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
 agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
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=====\n
*\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
 './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019 Google
 LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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governing permissions and\n \* limitations under the License.\n \*

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=====\n\n*\n\nimport { KernelConfig, LessEqual } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\nimport { createUnaryKernelConfig } from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport { KernelConfig, LogicalAnd } from '@tensorflow/tfjs-core';\nimport { createBinaryKernelConfig } from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"/**\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport { backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { permuteAxesAndTranspose } from './kernel_utils';\nimport { CppDType } from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n\n function max(args: { backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs }): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { reductionIndices: axis, keepDims } = attrs;\n const { x } = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const { transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the
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transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: max as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\ncreateBinaryKernelConfig(Maximum, supportsFullBroadcast);\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\n\nlet wasmMaxPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', //
padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', //
inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n
x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight =
convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft =
convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat: ` +\n `${convInfo.dataFormat}`. Please use 'channelsLast'.`);\n }\n\n
const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId =

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backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2],
filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig:
KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool
as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args:
{backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs};\n TensorInfo {\n const {backend, inputs,
attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if
(inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId
!== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input =
transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n
reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean',
reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed
tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend:

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BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n if (inputWasTransposed) {\n const transposedId =\n backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We\n will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n }\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('min', axes,\n inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape,\n axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n const out = backend.makeOutput(outShape,\n input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape,\n originalAxes);\n out.shape = newShape;\n }\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as\n KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *"
```

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=====\n\n*^\\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from\n './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2021 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *"
```

```
=====\n\n*^\\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-\n core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n// Must match\n enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction\n setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-\n paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n}\n\nfunction\n mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const\n {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n const outShape = paddings.map(\n (p, i) => p[0] /*\n beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out =\n backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const\n xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const prePaddingsFlat =
```

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paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n
const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const
postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes,
MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as { } as KernelFunc,\n setupFunc:
setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport { KernelConfig, Multiply } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from
'/binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport { KernelConfig, Neg } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n", "/*\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { BackendWasm } from '../backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`\n\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/*\n * Parse the result of the c++ method, which has the
shape equivalent to\n * `Result`\n */\n\nexport function parseResultStruct(\n backend: BackendWasm, resOffset:
number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const
pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const
pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores,
pValidOutputs};\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n
'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n
]);\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs:
NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,
maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n
// Since we are not using scores for V3, we have to delete it from the heap.\n
backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor
=\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as
KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'./backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n
'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n\nfunction nonMaxSuppressionV4(args: {\n
backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}):
TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor =
backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as
KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under

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```
=====
*/nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';nimport {BackendWasm} from
'./backend_wasm';nimport {parseResultStruct} from './NonMaxSuppression_util';nlet wasmFunc:n
(boxesId: number, scoresId: number, maxOutputSize: number, iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) => number;nfunction setup(backend: BackendWasm): void {n wasmFunc =
backend.wasm.cwrap(n NonMaxSuppressionV5, n 'number', // Result*n [n 'number', // boxesId*n
'nnumber', // scoresId*n 'number', // maxOutputSize*n 'number', // iouThreshold*n 'number', //
scoreThreshold*n 'number', // softNmsSigma*n]);n}nfunction kernelFunc(args: {n backend:
BackendWasm, n inputs: NonMaxSuppressionV5Inputs, n attrs: NonMaxSuppressionV5Attrs}): TensorInfo[]
{n const {backend, inputs, attrs} = args;n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma}
= attrs;n const {boxes, scores} = inputs;n const boxesId = backend.dataIdMap.get(boxes.dataId).id;n const
scoresId = backend.dataIdMap.get(scores.dataId).id;n const resOffset = wasmFunc(n boxesId, scoresId,
maxOutputSize, iouThreshold, scoreThreshold, n softNmsSigma);n const {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs} =n parseResultStruct(backend, resOffset);n // Since we are not using
validOutputs for V5, we have to delete it from the // heap.n backend.wasm._free(pValidOutputs);n const
selectedIndicesTensor =n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);n const
selectedScoresTensor =n backend.makeOutput([selectedSize], 'float32', pSelectedScores);n return
[selectedIndicesTensor, selectedScoresTensor];n}nexport const nonMaxSuppressionV5Config: KernelConfig =
{n kernelName: NonMaxSuppressionV5, n backendName: 'wasm', n setupFunc: setup, n kernelFunc: kernelFunc
as { } as KernelFunc, n};n"/**n * @licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed
under the Apache License, Version 2.0 (the "License");n * you may not use this file except in compliance with the
License.n * You may obtain a copy of the License atn *n * http://www.apache.org/licenses/LICENSE-2.0n *n *
Unless required by applicable law or agreed to in writing, softwaren * distributed under the License is distributed
on an "AS IS" BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.n * See the License for the specific language governing permissions andn * limitations under the
License.n *
```

```
=====
*/nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';nimport {createBinaryKernelConfig} from
'./binary_kernel';nconst supportsFullBroadcast = false;nexport const notEqualConfig: KernelConfig =n
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');n"/**n * @licensen * Copyright 2020
Google LLC. All Rights Reserved.n * Licensed under the Apache License, Version 2.0 (the "License");n * you
may not use this file except in compliance with the License.n * You may obtain a copy of the License atn *n *
http://www.apache.org/licenses/LICENSE-2.0n *n * Unless required by applicable law or agreed to in writing,
softwaren * distributed under the License is distributed on an "AS IS" BASIS,n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.n * See the License for the specific language
governing permissions andn * limitations under the License.n *
```

```
=====
*/nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-
core';nimport {BackendWasm} from './backend_wasm';nlet wasmOneHot: (n indicesId: number, depth:
number, onValue: number, offValue: number, n outId: number) => void;nfunction setup(backend:
BackendWasm) {n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [n 'number', // indices_id*n
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'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\n\nfunction
oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs,
backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out =
backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n
wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\n\nexport const oneHotConfig:
KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as
{} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.tensorArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\n\nexport const
onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as
{} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from '../backend_wasm';\nimport {concat} from './Concat';\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend:
BackendWasm, attrs: PackAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} =
attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n
util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n
util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const
expandedT =\n expandDims({input: t}, backend, attrs: {dim: axis});\n\n intermediateTensorInfos.push(expandedT);\n
return expandedT;\n});\n\n const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t =>
backend.disposeData(t.dataId));\n\n return result;\n}\n\n\nexport const packConfig: KernelConfig = {\n kernelName:
Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppType}
from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n
'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n
]);\n}\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const
{inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) =>
p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-
circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n
return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n}\n\nconst
xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const
outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =
new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple =>
padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n
new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new
Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length,
CppType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport
const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as
KernelFunc,\n setupFunc: setup\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'/binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from './backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number,
weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu =
backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' //
out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend}
= args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId =
backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n
if (input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n
inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n
}

```



```

const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype
!:= 'float32') {\n backend.disposeData(castedInput.dataId);\n } \n return out;\n}\n\nexport const preluConfig:
KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\nimport { backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util } from
'@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport
{ permuteAxesAndTranspose } from './kernel_utils';\n\nimport { CppDType } from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n}): TensorInfo {\n const { backend, inputs, attrs } = args;\n const { axis, keepDims } = attrs;\n const { x
} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{ transposed, axes, originalAxes, inputWasTransposed } =\n permuteAxesAndTranspose(x, axis, backend);\n\n let
reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n
 reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n
backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
 wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of
the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport
{ BackendWasm } from '../backend_wasm';\n\nimport { rangeImplCPU } from './kernel_utils/shared';\n\nexport const
range =\n (args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n const { backend, attrs } =
args;\n const { start, stop, step, dtype } = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n
 const out = backend.makeOutput([values.length], dtype);\n const outVals =
backendtypedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the

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=====
* \n\nimport { KernelConfig, RealDiv } from '@tensorflow/tfjs-core';\n\nimport { createBinaryKernelConfig } from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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* \n\nimport { KernelConfig, Relu } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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* \n\nimport { KernelConfig, Relu6 } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from './unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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* \n\nimport { KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { BackendWasm } from '../backend_wasm';\n\nimport { cast } from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n\n function resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n }): TensorInfo {\n const { backend, inputs, attrs } = args;\n\n const { images } = inputs;\n\n const { alignCorners, halfPixelCenters, size } = attrs;\n\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n\n let castedData;\n\n if (xData.dtype !== 'float32') {\n castedData =\n
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cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData =
backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmResizeBilinear(\n xId, batch, oldHeight,
oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n if
(castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n return out;\n }\n\nexport const
resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {identity} from
'./Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array,
axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n
'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n
'number', // out_id\n]);\n }\n\nexport function reverse(\n args: {inputs: ReverseInputs, backend: BackendWasm, attrs:
ReverseAttrs});\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} =
attrs;\n const axes = util.parseAxisParam(dims, x.shape);\n if (x.shape.length === 0) {\n return
identity({inputs: {x}, backend});\n }\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const axesBytes =
new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n wasmReverse(\n xId, axesBytes, axes.length, outShapeBytes, x.shape.length,
outId);\n const reshaped =\n reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n backend.disposeData(out.dataId);\n return reshaped;\n }\n\nexport const reverseConfig: KernelConfig = {\n
kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc:
setup\n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight:
number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', //
batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', //
radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n
'number', // outId\n]);\n }\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n

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backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n): TensorInfo {\n const {inputs, backend, attrs} =
args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out =
backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] =
image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight,
imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues =
typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n
[...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n
wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY,
fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n
kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n
setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'/unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from './backend_wasm';\n\nimport {CppType} from
'/types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', //
sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n
'number' // outId\n]);\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs:
ScatterNdInputs, attrs: ScatterNdAttrs});\n\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices,
updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if
(util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides,

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outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData =
backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData =
backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize,
stridesBytes, outputSize, outId);\n\n return out;\n}\n\n\nexport const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number,
offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect =
backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n 'number', // offset\n 'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =
backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank =
t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1:\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\n\nexport
const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {}
as KernelFunc,\n setupFunc: setup\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====
*\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /*\n void */,\n ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs});\n
TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out
= backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId,
outId);\n return out;\n}\n\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n", "/*\n * @license\n
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=====\n\n*\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n]);\n\n function softmax(\n args: {backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n }\n\n export const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n };\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\n\nimport {reshape} from './Reshape';\n\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(\n args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n }) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n const prod = util.sizeFromShape(blockShape);\n const completePaddings: Array<number, number> = [[0, 0]];\n completePaddings.push(...(paddings as Array<number, number>));\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n const paddedX = padV2Config.kernelFunc(\n {\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue: 0}\n } as TensorInfo\n);\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n const permutedReshapedPaddedPermutation =\n backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false\n);\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs: TransposeAttrs = {perm:
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permutedReshapedPaddedPermutation});\n const paddedXT =\n transpose({inputs: transposeInputs, backend,\n attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const\n resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n {inputs:\n resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return\n result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from\n './backend_wasm';\nimport {slice} from './Slice';\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:\n SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const\n {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes =\n backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] =\n s;\n const xSlice =\n slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n begin[$axis] += s;\n return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName:\n 'wasm',\n kernelFunc: splitV as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

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=====\n\n*\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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=====\n\n*\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from\n './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

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=====
*\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig}
from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig
=\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n"/**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-
core';\nimport {BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n
'number', // alpha\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction step(\n args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs});\n TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out =
backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId,
alpha, CCppType[x.dtype], outId);\n return out;\n }\n\n\nexport const stepConfig: KernelConfig = {\n kernelName:
Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n"/**\n *
@license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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```

=====
*\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport {reshape} from
 './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array,
xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n
 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', //
 outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n
inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n
const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n
 newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n
 sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n
 x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x},
backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is
memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have
rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n
// To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x},
backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape:

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finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out =
backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const
xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes
= new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new
Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const
outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes =
new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n
}\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n", "/*\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\ncreateBinaryKernelConfig(Sub, supportsFullBroadcast);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\nimport {BackendWasm} from './backend_wasm';\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppType} from './types';\n\nlet wasmSum: (xId:
number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n 'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n\n function sum(args: {backend:
BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
inputId = xId;\n let input = x;\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const
transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was
not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,
input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes,
input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmSum(inputId, reduceSize, CCppType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of

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the transposed tensor.\n backend.disposeData(transposed.dataId);\n })\n if (keepDims) {\n // reshape\n const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n
return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2021 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {createUnaryKernelConfig} from
'/unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n", "/*\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\nimport
{BackendWasm} from './backend_wasm';\nimport {CppType} from './types';\n\nlet wasmTile: (\n xId:
number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', //
x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} =
attrs;\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n const out =
backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return
out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: tile as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\nimport { CppDType } from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean, outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk: (\n args: { inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs }) =>\n TensorInfo[] | TensorInfo = ({ inputs, backend, attrs }) => {\n const { x } = inputs;\n const { k, sorted } = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n };\n}\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n\n=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util } from '@tensorflow/tfjs-core';\nimport { BackendWasm } from './backend_wasm';\n\nlet wasmTransform: (\n imageId: number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth: number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /* void */, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', // imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', // interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number', // outId\n]);\n}\n\nfunction transform(\n args: {\n backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs\n }):\n TensorInfo {\n const { backend, inputs, attrs } = args;\n const { image, transforms } = inputs;\n const { interpolation, fillMode, fillValue, outputShape } = attrs;\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape : [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth, numChannels] as [number, number, number, number];\n const strides =\n new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case
```

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'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,\n fillModeId, fillValue, outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as { } as\n KernelFunc\n};\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\nimport { BackendWasm } from '../backend_wasm';\nimport { slice } from\n './Slice';\n\nfunction unpack(\n args: { inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs }):\n TensorInfo[] {\n const { inputs, backend, attrs } = args;\n const { value } = inputs;\n let { axis } = attrs;\n if (axis <\n 0) {\n axis += value.shape.length;\n }\n const numOutputs = value.shape[axis];\n const rank =\n value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank;\n i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n const outs: TensorInfo[] = new\n Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({ inputs: { x: value }, attrs: { begin, size },\n backend});\n }\n return outs.map(({ dataId, dtype }) => ({ dataId, dtype, shape: outShape }));\n }\n\n export const\n unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as { } as\n KernelFunc,\n }; \n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====\n\n*\n\nimport { KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs } from '@tensorflow/tfjs-core';\nimport\n { BackendWasm } from '../backend_wasm';\n\nfunction zerosLike(args: { inputs: ZerosLikeInputs, backend:\n BackendWasm }) {\n const { inputs: { x }, backend } = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.toArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const\n zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike\n as { } as KernelFunc,\n }; \n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

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=====\n\n*\n\n//
```

We explicitly import the modular kernels so they get registered in the global registry when we compile the library. A modular build would replace the contents of this file and import only the kernels that are

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needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig}
from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from
 './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport
{anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig}
from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport
{batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport
{ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport
{concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport
{conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from
 './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from
 './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig}
from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from
 './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
 './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
 './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
 './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
 './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport
{fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
 './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
 './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
 './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
 './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
 './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
 './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
 './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
 './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
 './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from
 './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig}
from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
 './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
 './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
 './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
 './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
 './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
 './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
 './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from

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./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n", "/*\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {env} from '@tensorflow/tfjs-core';\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n
*\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array
passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that
contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new
Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26,
11\n]));\n\n/**\n * True if threads are supported.\n *\n// From: https://github.com/GoogleChromeLabs/wasm-
feature-detect\nENV.registerFlag("WASM_HAS_MULTITHREAD_SUPPORT", async () => {\n //
TODO(annxingyuan): Enable node support once this is resolved:\n //
https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n //
Test for transferability of SABs (needed for Firefox)\n //
https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZIHETpA/dwsMNchWEQAJ\n new
MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly
program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97,
115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26,
11\n]));\n } catch (e) {\n return false;\n };\n\n", "\nvar WasmBackendModuleThreadedSimd = (function() {\n
var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src :
undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return
(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd =
WasmBackendModuleThreadedSimd || {};\n\nfunction
GROWABLE_HEAP_I8(){if(wasmMemory.buffer!==buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}
return HEAP8}function

```

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GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!=="undefined"?WasmBackendModuleThreadedSimd: {};var
readyPromiseResolve,readyPromiseReject;Module["ready"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\.\/this.program";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window==="object";ENVIRONMENT_IS_WORKER=typeof
importScripts==="function";ENVIRONMENT_IS_NODE=typeof process==="object"&&typeof
process.versions==="object"&&typeof
process.versions.node==="string";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module["ENVIRONMENT_IS_PTHREAD"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module["buffer"];var scriptDirectory=""};function
locateFile(path){if(Module["locateFile"]){return Module["locateFile"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require("path").
dirname(scriptDirectory)+"\\"}else{scriptDirectory=__dirname+"\\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=
nodePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process["argv"].length>1){thisProgram=process["argv"][1].replace(/\\/g,"\\");arguments_=process["arg
v"].slice(2);process["on"]("uncaughtException",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process["on"]("unhandledRejection",abort);quit_=function(status){process["exit"](status)};Module["insp
ect"]=function(){return"[Emscripten Module object]"};var
nodeWorkerThreads;try{nodeWorkerThreads=require("worker_threads")}catch(e){console.error("The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?");throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!="undefined"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer==="function"){return new
Uint8Array(readbuffer(f))}data=read(f,"binary");assert(typeof data==="object");return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit==="function"){quit_=function(status){quit(status)}}if(typeof print!="undefined"){if(typeof
console==="undefined")console={};console.log=print;console.warn=console.error=typeof
printErr!="undefined"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof

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document!=="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !== "undefined" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf("blob:")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf("\^")+1)}else{scriptDirectory=""}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require("fs");if(!nodePath)nodePath=require("path");filename=n
odePath["normalize"](filename);return
nodeFS["readFileSync"](filename,binary?null:"utf8");}readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open("GET",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
===200||xhr.status===0&&xhr.response){onload(xhr.response);return}onerror();}xhr.onerror=onerror;xhr.send(null)
}setWindowTitle=function(title){document.title=title}else{if(ENVIRONMENT_IS_NODE){if(typeof
performance==="undefined"){global.performance=require("perf_hooks").performance}}var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str="";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)===192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)===224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id

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x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var
len=0;for(var i=0;i<str.length;++){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAtAt(++i)&1023;if(u<=127)+
+len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function
writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMem
ory=Module["wasmMemory"];buffer=Module["buffer"]}else{if(Module["wasmMemory"]){wasmMemory=
Module["wasmMemory"]}else{wasmMemory=new
WebAssembly.Memory({"initial":INITIAL_MEMORY/65536,"maximum":2147483648/65536,"shared":true});
if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err("requested a shared WebAssembly.Memory but the
returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not
have WebAssembly threads support - you may need to set a
flag");if(ENVIRONMENT_IS_NODE){console.log("(on node you may need: --experimental-wasm-threads --
experimental-wasm-bulk-memory and also use a recent version)")}throw Error("bad
memory")}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlob
alBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var
__ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var
runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){__wasm_call_ctors
()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["preRun"]){if(typeof
Module["preRun"]="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT
__)}function
preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function
exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function
postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module["postRun"]){if(typeof
Module["postRun"]="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt

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h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,"addRunDependency cannot be used in a
pthread
worker");runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](ru
nDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepen
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}
}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or("\nPthread aborting at "+(new
Error).stack);what+="\n";err(what);ABORT=true;EXITSTATUS=1;what="\nabort("+what+"). Build with -s
ASSERTIONS=1 for more info.";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-wasm-threaded-
simd.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+"\""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response)),reject}))}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={"a":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module["asm"]=exports;wasmTable=Module["asm"]["T"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(--numWorkersToLoad)removeRunDependency("\nwasm-
instantiate")}})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency("\nwasm-instantiate")}function
receiveInstantiatedSource(output){receiveInstance(output["instance"],output["module"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err("\nfailed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch==="function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("\nwasm streaming compile failed: "+reason);err("\nfalling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)})}}else{return

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instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1),0)}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var
ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,E
BADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EB
USY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENODIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN
OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERAN
GE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNA
TCH:110,ENOSCI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOA
NO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:
117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM
:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1
28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,
ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,
EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFU
SED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOST
DOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,E
PROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,EN
OTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:14
8,EILSEQ:25,E_OVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:13
5};function
__emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)retu
rn-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainTh
readWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return
1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"__emscripten_futex_wake\"]=__emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be
called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runni
ngWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio
n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cancelThread!\";var
pthread=PThread pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\": \"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only
ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in
cleanupThread!\";var

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pthread=PThread.threads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)} }var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);__emscripten_register_main_browser_thread_id(tb);initWorker:function(){},threads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop();if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())__pthread
_tsd_run_dtors();runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({"cmd\\":\\"exit\\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pht
hread_self(),-1);postMessage({"cmd\\":\\"cancelDone\\"})},terminateAllThreads:function(){for(var t in
PThread.threads){var
pthread=PThread.threads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)} }PThre
ad.threads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[],freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(funcio
n(){delete
PThread.threads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined}}),runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_mai
n_runtime_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var d=e["data"];var
cmd=d["cmd"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d["targetThread"]&&d["targetThread"]!=_pthread_self()){var
thread=PThread.threads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d["transferList"])}else{con
sole.error('Internal error! Worker sent a message \''+cmd+'\" to target pthread '+d["targetThread"]+'\", but that
thread no longer
exists!')}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\\"processQueuedMainThread
Work\\"){__emscripten_main_thread_process_queued_calls()}else
if(cmd===\\"spawnThread\\"){spawnThread(e.data)}else
if(cmd===\\"cleanupThread\\"){cleanupThread(d["thread"])}else
if(cmd===\\"killThread\\"){killThread(d["thread"])}else
if(cmd===\\"cancelThread\\"){cancelThread(d["thread"])}else

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if(cmd===\loaded\){ worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{ worker.runPthread();delete worker.runPthread } else if(cmd===\print\"){ out(\Thread \"+d[\\"threadId\"]+\\":
\"+d[\\"text\"]) } else if(cmd===\printErr\"){ err(\\"Thread \"+d[\\"threadId\"]+\\": \"+d[\\"text\"]) } else
if(cmd===\alert\"){ alert(\\"Thread \"+d[\\"threadId\"]+\\": \"+d[\\"text\"]) } else if(cmd===\exit\"){ var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){ PThread.returnWorkerToPool(worker) } else
if(cmd===\exitProcess\"){ try { exit(d[\\"returnCode\"]) } catch(e) { if(e instanceof ExitStatus) return; throw e } } else
if(cmd===\cancelDone\"){ PThread.returnWorkerToPool(worker) } else
if(cmd===\objectTransfer\"){ PThread.receiveObjectTransfer(e.data) } else
if(e.data.target===\setimmediate\"){ worker.postMessage(e.data) } else { err(\\"worker sent an unknown command
\"+cmd) } PThread.currentProxiedOperationCallerThread=undefined }; worker.onerror=function(e) { err(\\"pthread sent
an error! \"+e.filename+\\": \"+e.lineno+\\":
\"+e.message) }; if(ENVIRONMENT_IS_NODE) { worker.on(\\"message\",function(data) { worker.onmessage({ data:d
ata }) }); worker.on(\\"error\",function(data) { worker.onerror(data) }); worker.on(\\"exit\",function(data) { }) } } worker.post
Message({\"cmd\":\\"load\", \"urlOrBlob\":Module[\\"mainScriptUrlOrBlob\"]|_scriptDir,\\"wasmMemory\":wasmMe
memory,\\"wasmModule\":wasmModule}), allocateUnusedWorker:function() { var pthreadMainJs=locateFile(\\"tfjs-
backend-wasm-threaded-simd.worker.js\"); PThread.unusedWorkers.push(new
Worker(pthreadMainJs)), getNewWorker:function() { if(PThread.unusedWorkers.length===0) { PThread.allocateUnus
edWorker(); PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0]) } if(PThread.unusedWorkers.length>
0) return PThread.unusedWorkers.pop(); else return null }, busySpinWait:function(msecs) { var
t=performance.now()+msecs; while(performance.now()<t) { } }; function
establishStackSpace(stackTop,stackMax) { _emscripten_stack_set_limits(stackTop,stackMax); stackRestore(stackTop
)} Module[\\"establishStackSpace\"] = establishStackSpace; function getNoExitRuntime() { return
noExitRuntime } Module[\\"getNoExitRuntime\"] = getNoExitRuntime; function invokeEntryPoint(ptr, arg) { return
wasmTable.get(ptr)(arg) } Module[\\"invokeEntryPoint\"] = invokeEntryPoint; function
__assert_fail(condition, filename, line, func) { abort(\\"Assertion failed: \"+UTF8ToString(condition)+\\", at:
\"+[filename?UTF8ToString(filename):\\"unknown filename\", line, func?UTF8ToString(func):\\"unknown
function\"])} function __call_main(argc, argv) { var returnCode=_main(argc, argv) } var
_emscripten_get_now; if(ENVIRONMENT_IS_NODE) { _emscripten_get_now=function() { var
t=process[\\"hrtime\"](); return t[0]*1e3+t[1]/1e6 } } else
if(ENVIRONMENT_IS_PTHREAD) { _emscripten_get_now=function() { return performance.now()-
Module[\\"__performance_now_clock_drift\"] } } else if(typeof
dateNow!=="undefined") { _emscripten_get_now=dateNow } else _emscripten_get_now=function() { return
performance.now() }; function setErrNo(value) { GROWABLE_HEAP_I32()[__errno_location()>>2]=value; return
value } function _atexit(func, arg) { if(ENVIRONMENT_IS_PTHREAD) return
_emscripten_proxy_to_main_thread_js(1, 1, func, arg) } function
_emscripten_notify_thread_queue(targetThreadId, mainThreadId) { if(targetThreadId===mainThreadId) { postMessag
e({\"cmd\":\\"processQueuedMainThreadWork\"}) } } else
if(ENVIRONMENT_IS_PTHREAD) { postMessage({\"targetThread\":targetThreadId, \"cmd\":\\"processThreadQueu
e\"}) } } else { var pthread=PThread.pthreads[targetThreadId]; var
worker=pthread&&pthread.worker; if(!worker) { return } worker.postMessage({\"cmd\":\\"processThreadQueue\"}) } } ret
urn 1 } function _abort() { abort() } function _emscripten_asm_const_int(code, sigPtr, argbuf) { var
args=readAsmConstArgs(sigPtr, argbuf); return ASM_CONSTS[code].apply(null, args) } function
_emscripten_conditional_set_current_thread_status(expectedStatus, newStatus) { } function
_emscripten_futex_wait(addr, val, timeout) { if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0) return-
28; if(!ENVIRONMENT_IS_WEB) { var
ret=Atomics.wait(GROWABLE_HEAP_I32(), addr>>2, val, timeout); if(ret===\\"timed-out\") return-
73; if(ret===\\"not-equal\") return-6; if(ret===\\"ok\") return 0; throw\\"Atomics.wait returned an unexpected value

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\+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require("\os").cpus().length;return
navigator["hardwareConcurrency"]}function _emscripten_proxy_to_main_thread_js(index,sync){var
numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var
args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var
arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmmemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmmemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-
1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return

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x.precedence<y.precedence})),removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--
i;call.targetFunction.apply(null,call.argsList)},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return"";if(target==window)return"#window";
if(target==screen)return"#screen";return
target&&target.nodeName?target.nodeName:""},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}},function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):"";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!=="undefined"?document:0,typeof window!=="undefined"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!=="undefined"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function

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_emsripten_set_canvas_element_size_calling_thread(target,width,height){ var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){ GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){ var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){ canvas.GLctxObject.GLctx.viewport(0,0,width,height)} }else
if(canvas.canvasSharedPtr){ var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emsripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emsripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n_emsripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emsripten_set_canvas_element_size(target,width,height){ var
canvas=findCanvasEventTarget(target);if(canvas){ return
_emsripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emsripten_set_canvas_element_size_main_thread(target,width,height)} }function
_emsripten_set_current_thread_status(newStatus){ }function
_emsripten_set_thread_name(threadId,name){ }function __webgl_enable_ANGLE_instanced_arrays(ctx){ var
ext=ctx.getExtension("\ ANGLE_instanced_arrays");if(ext){ ctx["vertexAttribDivisor"]=function(index,divisor){ ex
t["vertexAttribDivisorANGLE"](index,divisor)};ctx["drawArraysInstanced"]=function(mode,first,count,primcou
nt){ ext["drawArraysInstancedANGLE"](mode,first,count,primcount)};ctx["drawElementsInstanced"]=function(
mode,count,type,indices,primcount){ ext["drawElementsInstancedANGLE"](mode,count,type,indices,primcount)};
return 1} }function __webgl_enable_OES_vertex_array_object(ctx){ var
ext=ctx.getExtension("\ OES_vertex_array_object");if(ext){ ctx["createVertexArray"]=function(){ return
ext["createVertexArrayOES"]();};ctx["deleteVertexArray"]=function(vao){ ext["deleteVertexArrayOES"](vao)};
ctx["bindVertexArray"]=function(vao){ ext["bindVertexArrayOES"](vao)};ctx["isVertexArray"]=function(vao)
{return ext["isVertexArrayOES"](vao)};return 1} }function __webgl_enable_WEBGL_draw_buffers(ctx){ var
ext=ctx.getExtension("\ WEBGL_draw_buffers");if(ext){ ctx["drawBuffers"]=function(n,bufs){ ext["drawBuffers
WEBGL"](n,bufs)};return 1} }function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension("\ WEBGL_multi_dra
w"))}var
GL={ counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{ },offscreenCanvases:{ },timerQueriesEXT:[],programInfos:{ },stringCache:{ },unpackAlignment:4,recordError:
function recordError(errorCode){ if(!GL.lastError){ GL.lastError=errorCode }},getNewId:function(table){ var
ret=GL.counter++;for(var i=table.length;i<ret;i++){ table[i]=null}return
ret},getSource:function(shader,count,string,length){ var source="\ ";for(var i=0;i<count;++i){ var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){ var
ctx=canvas.getContext("\ webgl",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){ var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={ handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx };if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof

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webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}}),populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)===\"|\"){name=name.slice(0,name.lastIndexOf(\"|\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"|\"+j+\"|\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
};var __emscripten_webgl_power_preferences=[\"default\", \"low-power\", \"high-performance\"];function
__emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var
contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
__emscripten_webgl_create_context(a0,a1){return __emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
__fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return __emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function __fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function

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_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emsripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iovcnt+i*8>>2];var len=GROWABLE_HEAP_I32()[iovcnt+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw"Internal Error! spawnThread()
can only ever be called from main application thread!";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw"Internal
error!";if(!threadParams.pthread_ptr)throw"Internal error, no pthread
ptr!";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread
_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emsripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={"cmd":"run","start_routine":threadParams.startRoutine,"arg":threadParams.arg,"threadInfoStruct":thre
adParams.pthread_ptr,"stackBase":threadParams.stackBase,"stackSize":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer==="undefined"){err("Current
environment does not support SharedArrayBuffer, pthreads are not available!");return
6}if(!pthread_ptr){err("pthread_create called with a null thread pointer!");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emsripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase===0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-
=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[threadInfoStruct>>2+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd="spawnThread";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var

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cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\Canceled!\}function
__emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\)}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\pthread_join attempted on a null thread
pointer!\);return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\PThread
\'+thread+\ is attempting to join to itself!\);return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&__emscripten_main_browser_thread_id()==thread){err(\Main thread
\'+thread+\ is attempting to join to itself!\);return ERRNO_CODES.EDEADLK}var
self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\pthread_join attempted on thread
\'+thread+\, which does not point to a valid thread, or does not exist anymore!\);return
ERRNO_CODES.ESRCH}var
detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\Attempted to join thread
\'+thread+\, which was already detached!\);return
ERRNO_CODES.EINVAL}if(block){__emscripten_check_blocking_allowed()}for(;;){var
threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var
threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[sta
tus>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PT
HREAD)cleanupThread(thread);else postMessage({\cmd\":"cleanupThread\","thread\":thread});return
0}if(!block){return
ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)__emscripten_main_thre
ad_process_queued_calls();__emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1
)}}function __pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function
__sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return
__emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var
maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case
235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case
159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case
48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return -1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\object\)return navigator[\hardwareConcurrency\]|1;return 1}}setErrNo(28);return-
1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var
proxiedFunctionTable=[null,_atexit,__emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr
ite,_sysconf];var
asmLibraryArg={\e\":__assert_fail,\r\":__call_main,\x\":__emscripten_notify_thread_queue,\b\":_abort,\y\":
__emscripten_asm_const_int,\j\":_emscripten_conditional_set_current_thread_status,\d\":_emscripten_futex_wait,\
c\":_emscripten_futex_wake,\f\":_emscripten_get_now,\p\":_emscripten_memcpy_big,\A\":_emscripten_num_l
ogical_cores,\u\":_emscripten_receive_on_main_thread_js,\q\":_emscripten_resize_heap,\v\":_emscripten_set_ca
nvas_element_size,\i\":_emscripten_set_current_thread_status,\s\":_emscripten_set_thread_name,\w\":_emscript

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en_webgl_create_context,\l\":"_fd_close,\n\":"_fd_seek,\g\":"_fd_write,\o\":"initPthreadsJS,\a\":"wasmMemory|Module["wasmMemory"],\z\":"_pthread_cleanup_pop,\k\":"_pthread_cleanup_push,\h\":"_pthread_create,\m\":"_pthread_join,\t\":"_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module["__wasm_call_ctors"]=function(){return(__wasm_call_ctors=Module["__wasm_call_ctors"]=Module["asm\"][\B\"]).apply(null,arguments)};var
_init=Module["_init"]=function(){return(_init=Module["_init"]=Module["asm\"][\C\"]).apply(null,arguments)};
var
_init_with_threads_count=Module["_init_with_threads_count"]=function(){return(_init_with_threads_count=Module["_init_with_threads_count"]=Module["asm\"][\D\"]).apply(null,arguments)};var
_get_threads_count=Module["_get_threads_count"]=function(){return(_get_threads_count=Module["_get_threads_count"]=Module["asm\"][\E\"]).apply(null,arguments)};var
_register_tensor=Module["_register_tensor"]=function(){return(_register_tensor=Module["_register_tensor"]=Module["asm\"][\F\"]).apply(null,arguments)};var
_dispose_data=Module["_dispose_data"]=function(){return(_dispose_data=Module["_dispose_data"]=Module["asm\"][\G\"]).apply(null,arguments)};var
_dispose=Module["_dispose"]=function(){return(_dispose=Module["_dispose"]=Module["asm\"][\H\"]).apply(null,arguments)};var
_Abs=Module["_Abs\"]=function(){return(_Abs=Module["_Abs\"]=Module["asm\"][\J\"]).apply(null,arguments)};var
_Add=Module["_Add"]=function(){return(_Add=Module["_Add"]=Module["asm\"][\K\"]).apply(null,arguments)};var
_AddN=Module["_AddN\"]=function(){return(_AddN=Module["_AddN\"]=Module["asm\"][\L\"]).apply(null,arguments)};var
_All=Module["_All\"]=function(){return(_All=Module["_All\"]=Module["asm\"][\M\"]).apply(null,arguments)};
var
_Any=Module["_Any\"]=function(){return(_Any=Module["_Any\"]=Module["asm\"][\N\"]).apply(null,arguments)};var
_ArgMax=Module["_ArgMax\"]=function(){return(_ArgMax=Module["_ArgMax\"]=Module["asm\"][\O\"]).apply(null,arguments)};var
_AvgPool=Module["_AvgPool\"]=function(){return(_AvgPool=Module["_AvgPool\"]=Module["asm\"][\P\"]).apply(null,arguments)};var
_BatchMatMul=Module["_BatchMatMul"]=function(){return(_BatchMatMul=Module["_BatchMatMul"]=Module["asm\"][\Q\"]).apply(null,arguments)};var
_Ceil=Module["_Ceil\"]=function(){return(_Ceil=Module["_Ceil\"]=Module["asm\"][\R\"]).apply(null,arguments)};var
_ClipByValue=Module["_ClipByValue"]=function(){return(_ClipByValue=Module["_ClipByValue"]=Module["asm\"][\S\"]).apply(null,arguments)};var
_Conv2D=Module["_Conv2D\"]=function(){return(_Conv2D=Module["_Conv2D\"]=Module["asm\"][\T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=function(){return(_Conv2DBackpropInput=Module["_Conv2DBackpropInput"]=Module["asm\"][\U\"]).apply(null,arguments)};var
_Cos=Module["_Cos\"]=function(){return(_Cos=Module["_Cos\"]=Module["asm\"][\V\"]).apply(null,arguments)};var
_Cosh=Module["_Cosh\"]=function(){return(_Cosh=Module["_Cosh\"]=Module["asm\"][\W\"]).apply(null,arguments)};var
_CropAndResize=Module["_CropAndResize\"]=function(){return(_CropAndResize=Module["_CropAndResize\"]=Module["asm\"][\X\"]).apply(null,arguments)};var
_Cumsum=Module["_Cumsum\"]=function(){return(_Cumsum=Module["_Cumsum\"]=Module["asm\"][\Y\"]).a

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ply(null,arguments)};var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][["Z"]]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][["_"]]).apply(null,arguments)};var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][["$"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][["aa"]]).apply(null,arguments)};var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][["ba"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][["ca"]]).apply(null,arguments)};var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][["da"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][["ea"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][["la"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][["na"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["ua"]]).apply(null,ar

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gments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["xa"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["za"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["La"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Sa"]]).

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apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Va"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Wa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Xa"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ya"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Za"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["_a"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["$a"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["ab"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["bb"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["cb"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["db"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["eb"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["fb"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["gb"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["hb"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["ib"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["jb"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["kb"]]).apply(null,arguments)};var
_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=function(){return(_emscripten_get_global_libc=Module["_emscripten_get_global_libc"]=Module["asm"][["lb"]]).apply(null,arguments)};var
_pthread_self=Module["_pthread_self"]=function(){return(_pthread_self=Module["_pthread_self"]=Module["asm"][["mb"]]).apply(null,arguments)};var
__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=function(){return(__pthread_tsd_run_dtors=Module["__pthread_tsd_run_dtors"]=Module["asm"][["nb"]]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=fu

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nction(){return(_emscripten_main_thread_process_queued_calls=Module["_emscripten_main_thread_process_queued_calls"]=Module["asm"]["ob"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=function(){return(_emscripten_current_thread_process_queued_calls=Module["_emscripten_current_thread_process_queued_calls"]=Module["asm"]["pb"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=function(){return(_emscripten_register_main_browser_thread_id=Module["_emscripten_register_main_browser_thread_id"]=Module["asm"]["qb"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=function(){return(_emscripten_main_browser_thread_id=Module["_emscripten_main_browser_thread_id"]=Module["asm"]["rb"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module["_emscripten_do_dispatch_to_thread"]=function(){return(__emscripten_do_dispatch_to_thread=Module["_emscripten_do_dispatch_to_thread"]=Module["asm"]["sb"]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module["_emscripten_sync_run_in_main_thread_4"]=Module["asm"]["tb"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module["_emscripten_run_in_main_runtime_thread_js"]=Module["asm"]["ub"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module["_emscripten_call_on_thread"]=function(){return(__emscripten_call_on_thread=Module["_emscripten_call_on_thread"]=Module["asm"]["vb"]).apply(null,arguments)};var
_emscripten_tls_init=Module["_emscripten_tls_init"]=function(){return(_emscripten_tls_init=Module["_emscripten_tls_init"]=Module["asm"]["wb"]).apply(null,arguments)};var
__emscripten_thread_init=Module["_emscripten_thread_init"]=function(){return(__emscripten_thread_init=Module["_emscripten_thread_init"]=Module["asm"]["xb"]).apply(null,arguments)};var
stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"]["yb"]).apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]["zb"]).apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"]["Ab"]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module["_emscripten_stack_set_limits"]=function(){return(_emscripten_stack_set_limits=Module["_emscripten_stack_set_limits"]=Module["asm"]["Bb"]).apply(null,arguments)};var
_memalign=Module["_memalign"]=function(){return(_memalign=Module["_memalign"]=Module["asm"]["Cb"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module["_emscripten_allow_main_runtime_queued_calls"]=10512;var
__emscripten_main_thread_futex=Module["_emscripten_main_thread_futex"]=12148;Module["cwrap"]=cwrap;Module["PThread"]=PThread;Module["PThread"]=PThread;Module["wasmMemory"]=wasmMemory;Module["ExitStatus"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name="ExitStatus";this.message="Program terminated with
exit("+status+")";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromiseResolve(Module);initRuntime();postMessage({"cmd":"loaded"});return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(

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);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"]Module[\"onRuntimeInitialized\"]());postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\"),1);doRun(),1)}else{doRun()}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\": \"exitProcess\", \"returnCode\": status});throw new
ExitStatus(status)}else{}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"]Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]===\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n return WasmBackendModuleThreadedSimd.ready\n\n\n});\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"] =
WasmBackendModuleThreadedSimd;\n\", \"export const wasmWorkerContents = 'var Module={ };function
threadPrintErr(){ var text=Array.prototype.slice.call(arguments).join(\\\" \\\\");console.error(text)}function
threadAlert(){ var text=Array.prototype.slice.call(arguments).join(\\
\\");postMessage({ cmd: \"alert\", text: text, threadId: Module[\"_pthread_self\"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){ var
instance=new
WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){ }this.onmessage=function(e){ try {if(e.data.cmd===\"load\") {Module[\"wasmModule\"]=e.data. wa
smModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;
Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
e.data.urlOrBlob===\"string\") {importScripts(e.data.urlOrBlob)} else { var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl) }
WasmBackendModuleThreadedSimd(Module).then(function(instance){ Module=instance;moduleLoaded()})} else
if(e.data.cmd===\"objectTransfer\") {Module[\"PThread\"].receiveObjectTransfer(e.data)} else
if(e.data.cmd===\"run\") {Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](),1);try { var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[
\"PThread\"].threadExit(result)} catch(ex){ if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()} else
if(ex!==\"unwind\") {if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){ } else {Module[\"PThread\"].threadExit(ex.status)} } el
se {Module[\"PThread\"].threadExit(-2);throw ex } } } else
if(e.data.cmd===\"cancel\") {if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()} } else
if(e.data.target===\"setimmediate\") { } else
if(e.data.cmd===\"processThreadQueue\") {if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()} } else {err(\\\"worker.js received unknown command
\\\"+e.data.cmd);err(e.data)} } catch(ex){err(\\\"worker.js onmessage() captured an uncaught exception:
\\\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex } };if(typeof process===\"object\" &&typeof
process.versions===\"object\" &&typeof process.versions.node===\"string\") {self={location: {href: __filename}}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\\\"worker_threads\\\");global.Worker=nodeWorkerThreads.Worker;var

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parentPort=nodeWorkerThreads.parentPort;parentPort.on(\message\,function(data){onmessage({data:data})});var
nodeFS=require(\fs\);var nodeRead=function(filename){return nodeFS.readFileSync(filename,\utf8\)};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f));postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\undefined\){performance={now:function(){return Date.now()}}};\nvar
WasmBackendModule = (function() {\n var __scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined')
__scriptDir = __scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule =
WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!=="undefined"?WasmBackendModule: {} ;var
readyPromiseResolve,readyPromiseReject;Module[\ready\]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\./this.program\;var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\object\;ENVIRONMENT_IS_WORKER=typeof
importScripts===\function\;ENVIRONMENT_IS_NODE=typeof process===\object\&&typeof
process.versions===\object\&&typeof
process.versions.node===\string\;ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\;\;function
locateFile(path){if(Module[\locateFile\]){return Module[\locateFile\](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\path\).
dirname(scriptDirectory)+\^\}else{scriptDirectory=__dirname+\^\}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\fs\);if(!nodePath)nodePath=require(\path\);filename=n
odePath[\normalize\](filename);return
nodeFS[\readFileSync\](filename,binary?null:\utf8\)};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\argv\].length>1){thisProgram=process[\argv\][1].replace(/\\/g,\^)}arguments_=process[\arg
v\].slice(2);process[\on\](\uncaughtException\,function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\on\](\unhandledRejection\,abort);quit_=function(status){process[\exit\](status)};Module[\inSp
ect\]=function(){return\[Emscripten Module object\]} }else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=="undefined"){read_=function shell_read(f){return read(f)} }readBinary=function readBinary(f){var
data;if(typeof readbuffer===\function\){return new
Uint8Array(readbuffer(f))}data=read(f,\binary\);assert(typeof data===\object\);return data};if(typeof
scriptArgs!="undefined"){arguments_=scriptArgs}else if(typeof
arguments!="undefined"){arguments_=arguments}if(typeof
quit===\function\){quit_=function(status){quit(status)}}if(typeof print!=="undefined"){if(typeof
console===\undefined\){console={};console.log=print;console.warn=console.error=typeof
printErr!=="undefined"?printErr:print} }else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!=="undefined"&&document.currentScript){scriptDirectory=document.currentScript.src}if(__scriptDir){s
criptDirectory=__scriptDir;if(scriptDirectory.indexOf(\blob:\")==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\^")+1)}else{scriptDirectory=\}\} }read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\GET\,url,false);xhr.send(null);return

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xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,false);xhr.responseType="arraybuffer";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open("\GET",url,true);xhr.responseType="arraybuffer";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title} }else{ }var
out=Module["print"]||console.log.bind(console);var err=Module["printErr"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]} }moduleOverr
ides=null;if(Module["arguments"])arguments_=Module["arguments"];if(Module["thisProgram"])thisProgram=
Module["thisProgram"];if(Module["quit"])quit_=Module["quit"];var
wasmBinary;if(Module["wasmBinary"])wasmBinary=Module["wasmBinary"];var
noExitRuntime=Module["noExitRuntime"]||true;if(typeof WebAssembly!=="object"){abort("no native wasm
support detected")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort("Assertion failed: "+text)}}function getCFunc(ident){var
func=Module["_"+ident];assert(func,"Cannot call unknown function "+ident+", make sure it is exported");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={"string":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},"array":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType==="string")return UTF8ToString(ret);if(returnType==="boolean")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type==="number"});var
numericRet=returnType!=="string";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)} }var UTF8Decoder=typeof
TextDecoder!=="undefined"?new TextDecoder("utf8"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str="";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):""}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAtAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAtAt(++i);u=65536+((u&1023)<<10|u1&1023)}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function

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stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module["HEAP8"]=HEAP8=new
Int8Array(buf);Module["HEAP16"]=HEAP16=new Int16Array(buf);Module["HEAP32"]=HEAP32=new
Int32Array(buf);Module["HEAPU8"]=HEAPU8=new Uint8Array(buf);Module["HEAPU16"]=HEAPU16=new
Uint16Array(buf);Module["HEAPU32"]=HEAPU32=new
Uint32Array(buf);Module["HEAPF32"]=HEAPF32=new
Float32Array(buf);Module["HEAPF64"]=HEAPF64=new Float64Array(buf)}var
INITIAL_MEMORY=Module["INITIAL_MEMORY"]||16777216;var wasmTable;var __ATPRERUN__=[];var
__ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var
runtimeInitialized=false;__ATINIT__.push({func:function(){__wasm_call_ctors()}});function
preRun(){if(Module["preRun"]){if(typeof
Module["preRun"]=="function")Module["preRun"]=[Module["preRun"]];while(Module["preRun"].length){a
ddOnPreRun(Module["preRun"].shift())}callRuntimeCallbacks(__ATPRERUN__)}function
initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function
preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module["postRun"]){if(typeof
Module["postRun"]=="function")Module["postRun"]=[Module["postRun"]];while(Module["postRun"].lengt
h){addOnPostRun(Module["postRun"].shift())}callRuntimeCallbacks(__ATPOSTRUN__)}function
addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var
runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function
addRunDependency(id){runDependencies++;if(Module["monitorRunDependencies"]){Module["monitorRunDep
endencies"](runDependencies)}function removeRunDependency(id){runDependencies--
;if(Module["monitorRunDependencies"]){Module["monitorRunDependencies"](runDependencies)}if(runDepend
encies==0){if(runDependencyWatcher!=null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul
l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}Module["preloadedImages"]={};Module
["preloadedAudios"]={};function
abort(what){if(Module["onAbort"]){Module["onAbort"](what)}what+="\n";err(what);ABORT=true;EXITSTAT
US=1;what="abort("+what+"). Build with -s ASSERTIONS=1 for more info.";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix="data:application/octet-stream;base64,";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix="file://";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile="tfjs-backend-
wasm.wasm";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file===wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw"both async and sync fetching of the
wasm failed"}}catch(err){abort(err)}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch==="function"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){if(!response["ok"]){throw"failed to load wasm binary file at
"+wasmBinaryFile+""}return response["arrayBuffer"]()).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)}))}}return Promise.resolve().then(function(){return

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getBinary(wasmBinaryFile)})function createWasm(){ var info={"a":asmLibraryArg};function
receiveInstance(instance,module){ var
exports=instance.exports;Module["asm"]=exports;wasmMemory=Module["asm"]["j"];updateGlobalBufferAnd
Views(wasmMemory.buffer);wasmTable=Module["asm"]["r"];removeRunDependency("wasm-
instantiate")}addRunDependency("wasm-instantiate");function
receiveInstantiatedSource(output){receiveInstance(output["instance"]);function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info))).then(receiver,function(reason){err("failed to asynchronously prepare
wasm: "+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===function"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===function"){return fetch(wasmBinaryFile,{credentials:"same-
origin"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err("wasm streaming compile failed: "+reason);err("falling
back to ArrayBuffer instantiation");return instantiateArrayBuffer(receiveInstantiatedSource)}))}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}if(Module["instantiateWasm"]){try{var
exports=Module["instantiateWasm"](info,receiveInstance);return exports}catch(e){err("Module.instantiateWasm
callback failed with error: "+e);return false}}instantiateAsync().catch(rejectPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback===function){callback(Module);continue}var func=callback.func;if(typeof
func===number){if(callback.arg===undefined){wasmTable.get(func)}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return
ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function
_fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iiov,iiovcnt,pnum){var num=0;for(var
i=0;i<iiovcnt;i++){var ptr=HEAP32[iiov+i*8>>2];var len=HEAP32[iiov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_thread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case
242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case

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169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-
1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case
131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return
32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case
37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return
16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return
64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof
navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1 } }setErrNo(28);return-1 }var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
__wasm_call_ctors=Module[\"__wasm_call_ctors\"]=function(){return(__wasm_call_ctors=Module[\"__wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"
asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var

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_Cos=Module["_Cos"]=function(){return(_Cos=Module["_Cos"]=Module["asm"][\["E"]]).apply(null,arguments
)};var
_Cosh=Module["_Cosh"]=function(){return(_Cosh=Module["_Cosh"]=Module["asm"][\["F"]]).apply(null,arguments);var
_CropAndResize=Module["_CropAndResize"]=function(){return(_CropAndResize=Module["_CropAndResize"]=Module["asm"][\["G"]]).apply(null,arguments);var
_Cumsum=Module["_Cumsum"]=function(){return(_Cumsum=Module["_Cumsum"]=Module["asm"][\["H"]]).apply(null,arguments);var
_DepthToSpace=Module["_DepthToSpace"]=function(){return(_DepthToSpace=Module["_DepthToSpace"]=Module["asm"][\["I"]]).apply(null,arguments);var
_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=function(){return(_DepthwiseConv2dNative=Module["_DepthwiseConv2dNative"]=Module["asm"][\["J"]]).apply(null,arguments);var
_Elu=Module["_Elu"]=function(){return(_Elu=Module["_Elu"]=Module["asm"][\["K"]]).apply(null,arguments)};var
_Equal=Module["_Equal"]=function(){return(_Equal=Module["_Equal"]=Module["asm"][\["L"]]).apply(null,arguments);var
_Exp=Module["_Exp"]=function(){return(_Exp=Module["_Exp"]=Module["asm"][\["M"]]).apply(null,arguments)};var
_FlipLeftRight=Module["_FlipLeftRight"]=function(){return(_FlipLeftRight=Module["_FlipLeftRight"]=Module["asm"][\["N"]]).apply(null,arguments);var
_Floor=Module["_Floor"]=function(){return(_Floor=Module["_Floor"]=Module["asm"][\["O"]]).apply(null,arguments)};var
_FloorDiv=Module["_FloorDiv"]=function(){return(_FloorDiv=Module["_FloorDiv"]=Module["asm"][\["P"]]).apply(null,arguments)};var
_FusedBatchNorm=Module["_FusedBatchNorm"]=function(){return(_FusedBatchNorm=Module["_FusedBatchNorm"]=Module["asm"][\["Q"]]).apply(null,arguments)};var
_FusedConv2D=Module["_FusedConv2D"]=function(){return(_FusedConv2D=Module["_FusedConv2D"]=Module["asm"][\["R"]]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=function(){return(_FusedDepthwiseConv2D=Module["_FusedDepthwiseConv2D"]=Module["asm"][\["S"]]).apply(null,arguments)};var
_Gather=Module["_Gather"]=function(){return(_Gather=Module["_Gather"]=Module["asm"][\["T"]]).apply(null,arguments)};var
_GatherNd=Module["_GatherNd"]=function(){return(_GatherNd=Module["_GatherNd"]=Module["asm"][\["U"]]).apply(null,arguments)};var
_Greater=Module["_Greater"]=function(){return(_Greater=Module["_Greater"]=Module["asm"][\["V"]]).apply(null,arguments)};var
_GreaterEqual=Module["_GreaterEqual"]=function(){return(_GreaterEqual=Module["_GreaterEqual"]=Module["asm"][\["W"]]).apply(null,arguments)};var
_LeakyRelu=Module["_LeakyRelu"]=function(){return(_LeakyRelu=Module["_LeakyRelu"]=Module["asm"][\["X"]]).apply(null,arguments)};var
_Less=Module["_Less"]=function(){return(_Less=Module["_Less"]=Module["asm"][\["Y"]]).apply(null,arguments)};var
_LessEqual=Module["_LessEqual"]=function(){return(_LessEqual=Module["_LessEqual"]=Module["asm"][\["Z"]]).apply(null,arguments)};var
_Log=Module["_Log"]=function(){return(_Log=Module["_Log"]=Module["asm"][\["_"]]).apply(null,arguments)};var
_LogicalAnd=Module["_LogicalAnd"]=function(){return(_LogicalAnd=Module["_LogicalAnd"]=Module["asm"][\["$"]]).apply(null,arguments)};var

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_Max=Module["_Max"]=function(){return(_Max=Module["_Max"]=Module["asm"][["aa"]]).apply(null,arguments)};var
_MaxPool=Module["_MaxPool"]=function(){return(_MaxPool=Module["_MaxPool"]=Module["asm"][["ba"]]).
apply(null,arguments)};var
_Maximum=Module["_Maximum"]=function(){return(_Maximum=Module["_Maximum"]=Module["asm"][["ca"]]).apply(null,arguments)};var
_Mean=Module["_Mean"]=function(){return(_Mean=Module["_Mean"]=Module["asm"][["da"]]).apply(null,arguments)};var
_Min=Module["_Min"]=function(){return(_Min=Module["_Min"]=Module["asm"][["ea"]]).apply(null,arguments)};var
_Minimum=Module["_Minimum"]=function(){return(_Minimum=Module["_Minimum"]=Module["asm"][["fa"]]).apply(null,arguments)};var
_MirrorPad=Module["_MirrorPad"]=function(){return(_MirrorPad=Module["_MirrorPad"]=Module["asm"][["ga"]]).apply(null,arguments)};var
_Multiply=Module["_Multiply"]=function(){return(_Multiply=Module["_Multiply"]=Module["asm"][["ha"]]).apply(null,arguments)};var
_Neg=Module["_Neg"]=function(){return(_Neg=Module["_Neg"]=Module["asm"][["ia"]]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=function(){return(_NonMaxSuppressionV3=Module["_NonMaxSuppressionV3"]=Module["asm"][["ja"]]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=function(){return(_NonMaxSuppressionV4=Module["_NonMaxSuppressionV4"]=Module["asm"][["ka"]]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=function(){return(_NonMaxSuppressionV5=Module["_NonMaxSuppressionV5"]=Module["asm"][["la"]]).apply(null,arguments)};var
_NotEqual=Module["_NotEqual"]=function(){return(_NotEqual=Module["_NotEqual"]=Module["asm"][["ma"]]).apply(null,arguments)};var
_OneHot=Module["_OneHot"]=function(){return(_OneHot=Module["_OneHot"]=Module["asm"][["na"]]).apply(null,arguments)};var
_PadV2=Module["_PadV2"]=function(){return(_PadV2=Module["_PadV2"]=Module["asm"][["oa"]]).apply(null,arguments)};var
_Pow=Module["_Pow"]=function(){return(_Pow=Module["_Pow"]=Module["asm"][["pa"]]).apply(null,arguments)};var
_Prelu=Module["_Prelu"]=function(){return(_Prelu=Module["_Prelu"]=Module["asm"][["qa"]]).apply(null,arguments)};var
_Prod=Module["_Prod"]=function(){return(_Prod=Module["_Prod"]=Module["asm"][["ra"]]).apply(null,arguments)};var
_RealDiv=Module["_RealDiv"]=function(){return(_RealDiv=Module["_RealDiv"]=Module["asm"][["sa"]]).apply(null,arguments)};var
_Relu=Module["_Relu"]=function(){return(_Relu=Module["_Relu"]=Module["asm"][["ta"]]).apply(null,arguments)};var
_Relu6=Module["_Relu6"]=function(){return(_Relu6=Module["_Relu6"]=Module["asm"][["ua"]]).apply(null,arguments)};var
_ResizeBilinear=Module["_ResizeBilinear"]=function(){return(_ResizeBilinear=Module["_ResizeBilinear"]=Module["asm"][["va"]]).apply(null,arguments)};var
_Reverse=Module["_Reverse"]=function(){return(_Reverse=Module["_Reverse"]=Module["asm"][["wa"]]).apply(null,arguments)};var
_RotateWithOffset=Module["_RotateWithOffset"]=function(){return(_RotateWithOffset=Module["_RotateWithOffset"]=Module["asm"][["xa"]]).apply(null,arguments)};var

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_Round=Module["_Round"]=function(){return(_Round=Module["_Round"]=Module["asm"][["ya"]]).apply(null,arguments)};var
_Rsqrt=Module["_Rsqrt"]=function(){return(_Rsqrt=Module["_Rsqrt"]=Module["asm"][["za"]]).apply(null,arguments)};var
_ScatterNd=Module["_ScatterNd"]=function(){return(_ScatterNd=Module["_ScatterNd"]=Module["asm"][["Aa"]]).apply(null,arguments)};var
_SelectV2=Module["_SelectV2"]=function(){return(_SelectV2=Module["_SelectV2"]=Module["asm"][["Ba"]]).apply(null,arguments)};var
_Sigmoid=Module["_Sigmoid"]=function(){return(_Sigmoid=Module["_Sigmoid"]=Module["asm"][["Ca"]]).apply(null,arguments)};var
_Sin=Module["_Sin"]=function(){return(_Sin=Module["_Sin"]=Module["asm"][["Da"]]).apply(null,arguments)};var
_Softmax=Module["_Softmax"]=function(){return(_Softmax=Module["_Softmax"]=Module["asm"][["Ea"]]).apply(null,arguments)};var
_Sqrt=Module["_Sqrt"]=function(){return(_Sqrt=Module["_Sqrt"]=Module["asm"][["Fa"]]).apply(null,arguments)};var
_Square=Module["_Square"]=function(){return(_Square=Module["_Square"]=Module["asm"][["Ga"]]).apply(null,arguments)};var
_SquaredDifference=Module["_SquaredDifference"]=function(){return(_SquaredDifference=Module["_SquaredDifference"]=Module["asm"][["Ha"]]).apply(null,arguments)};var
_Step=Module["_Step"]=function(){return(_Step=Module["_Step"]=Module["asm"][["Ia"]]).apply(null,arguments)};var
_StridedSlice=Module["_StridedSlice"]=function(){return(_StridedSlice=Module["_StridedSlice"]=Module["asm"][["Ja"]]).apply(null,arguments)};var
_Sub=Module["_Sub"]=function(){return(_Sub=Module["_Sub"]=Module["asm"][["Ka"]]).apply(null,arguments)};var
_Sum=Module["_Sum"]=function(){return(_Sum=Module["_Sum"]=Module["asm"][["La"]]).apply(null,arguments)};var
_Tan=Module["_Tan"]=function(){return(_Tan=Module["_Tan"]=Module["asm"][["Ma"]]).apply(null,arguments)};var
_Tanh=Module["_Tanh"]=function(){return(_Tanh=Module["_Tanh"]=Module["asm"][["Na"]]).apply(null,arguments)};var
_Tile=Module["_Tile"]=function(){return(_Tile=Module["_Tile"]=Module["asm"][["Oa"]]).apply(null,arguments)};var
_TopK=Module["_TopK"]=function(){return(_TopK=Module["_TopK"]=Module["asm"][["Pa"]]).apply(null,arguments)};var
_Transform=Module["_Transform"]=function(){return(_Transform=Module["_Transform"]=Module["asm"][["Qa"]]).apply(null,arguments)};var
_Transpose=Module["_Transpose"]=function(){return(_Transpose=Module["_Transpose"]=Module["asm"][["Ra"]]).apply(null,arguments)};var
__FusedMatMul=Module["__FusedMatMul"]=function(){return(__FusedMatMul=Module["__FusedMatMul"]=Module["asm"][["Sa"]]).apply(null,arguments)};var
_malloc=Module["_malloc"]=function(){return(_malloc=Module["_malloc"]=Module["asm"][["Ta"]]).apply(null,arguments)};var
_free=Module["_free"]=function(){return(_free=Module["_free"]=Module["asm"][["Ua"]]).apply(null,arguments)};var
__errno_location=Module["__errno_location"]=function(){return(__errno_location=Module["__errno_location"]=Module["asm"][["Va"]]).apply(null,arguments)};var

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stackSave=Module["stackSave"]=function(){return(stackSave=Module["stackSave"]=Module["asm"])[\"Wa\"]}.
apply(null,arguments)};var
stackRestore=Module["stackRestore"]=function(){return(stackRestore=Module["stackRestore"]=Module["asm"]
)[\"Xa\"]}.apply(null,arguments)};var
stackAlloc=Module["stackAlloc"]=function(){return(stackAlloc=Module["stackAlloc"]=Module["asm"])[\"Ya\"]
}.apply(null,arguments)};Module["cwrap"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module["calledRun"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module["onRuntimeInitialized"])Module["onRuntimeInitialized"]();postRun(
)}if(Module["setStatus"]){Module["setStatus"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule["setStatus"](\"\");},1);doRun()},1)}else{doRun()}}Module["run"]=run;if(Module["preInit"]){if(typeof
Module["preInit"]=="function")Module["preInit"]=[Module["preInit"]];while(Module["preInit"].length>0){
Module["preInit"].pop()}run();\n\n\n return WasmBackendModule.ready\n\n\n);}\n\n\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports["WasmBackendModule"] = WasmBackendModule;\n"/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\nimport './flags_wasm';\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasmModule,
WasmFactoryConfig} from './wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'./wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from './wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from './wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from './wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport
type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends
KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap:
DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++; \n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *

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util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n memoryOffset);\n }\n }\n }\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return this.readSync(dataId);\n }\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset, dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n }\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @param force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data = this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n }\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n this.dataIdMap.delete(dataId);\n }\n return true;\n }\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n incRef(dataId: DataId) {\n const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n floatPrecision(): 32 {\n return 32;\n }\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n memory() {\n return {unreliable: false};\n }\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset == null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id = this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const {memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset, size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n function createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n // miniprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n imports.env.a(`failed to load wasm binary file at '${path}'`);\n }\n response.arrayBuffer().then(binary => {\n WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n });\n });\n });\n return {};\n });\n }\n /**\n * Returns the path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\n function getPathToWasmBinary(\n simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n // If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return wasmPath;\n }\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported && threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path = 'tfjs-backend-wasm-simd.wasm';\n }\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n
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return wasmFileMap[path];\n }\n }\n\n return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\nexport async function init(): Promise<{ wasm: BackendWasmModule}> {\n const
[simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n\n return new Promise((resolve, reject) =>
{\n const factoryConfig: WasmFactoryConfig = {};\n\n /**\n * This function overrides the Emscripten
module locateFile utility.\n * @param path The relative path to the file that needs to be loaded.\n * @param
prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n const response = wasmWorkerContents;\n const blob = new
Blob([response], {type: 'application/javascript'});\n return URL.createObjectURL(blob);\n }\n\n if
(path.endsWith('.wasm')) {\n return getPathToWasmBinary(\n simdSupported as boolean,\n
threadsSupported as boolean,\n wasmPathPrefix != null ? wasmPathPrefix : prefix);\n }\n\n return prefix
+ path;\n });\n\n // Use the instantiateWasm override when system fetch is not available.\n // Reference:\n //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as
boolean,\n wasmPathPrefix != null ? wasmPathPrefix : ''));\n }\n\n let initialized = false;\n
factoryConfig.onAbort = () => {\n if (initialized) {\n // Emscripten already called console.warn so no need to
double log.\n return;\n }\n if (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double
error\n // messages.\n return;\n }\n initAborted = true;\n const rejectMsg =\n 'Make sure the
server can serve the `.wasm` file relative to the '+\n 'bundled js file. For more details see
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n
reject({message: rejectMsg});\n });\n\n let wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has
been defined we must initialize the vanilla module.\n if (threadsSupported && simdSupported && wasmPath ==
null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob([\n [var WasmBackendModuleThreadedSimd = `
+\n wasmFactoryThreadedSimd.toString()],\n {type: 'text/javascript'});\n wasm =
wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD
binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully
created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string =
null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init:
module.cwrap('init', null, []),\n initWithThreadCount:\n module.cwrap('init_with_threads_count', null,
['number']),\n getThreadCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor:
module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n
 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType,
['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({ wasm: module });\n
 });\n\n });\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType):
backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case
'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n
throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-
wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const;\n\ntype
WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:
string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet
customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file
which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more

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details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n * the wasm file, default to false.\n * \n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.);\n if
(initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n
 'setWasmPath()' before you call `tf.setBackend()` or `tf.ready()`);\n }\n wasmPath = path;\n customFetch =
usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n * \n * `js\n * setWasmPaths({\n
* 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *
'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n *
`\n * \n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory
where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n *
SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n *
full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located
in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional
boolean to use platform fetch to download\n * the wasm file, default to false.\n * \n * @doc {heading:
'Environment', namespace: 'wasm'}\n *\nexport function setWasmPaths(\n prefixOrFileMap: string|{\n [key in
WasmBinaryName]?: string,\n usePlatformFetch = false):\n void {\n if (initAborted) {\n throw new Error(\n
'The WASM backend was already initialized. Make sure you call ' +\n 'setWasmPaths()' before you call
`tf.setBackend()` or ' +\n 'tf.ready()`);\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix
= prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new
Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please
either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n
 `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n }\n}\n\n/**
Used in unit tests. *\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n
wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet
actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n *
threadpool (default to the number of logical CPU cores).\n * \n * This must be called before calling
`tf.setBackend('wasm')`.\n *\nexport function setThreadsCount(numThreads: number) {\n threadsCount =
numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n * \n * It is set after the
backend is initialized.\n *\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw
new Error('WASM backend not initialized.);\n }\n return actualThreadsCount;\n}\n\n",/** @license See the
LICENSE file. *\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport
{version};\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
\n
\n=====\n
*\nimport './flags_wasm';\nimport {registerBackend} from '@tensorflow/tfjs-core';\nimport {BackendWasm,
init} from './backend_wasm';\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath,
setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst
WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new
BackendWasm(wasm);\n},\n WASM_PRIORITY);\n\n,"names":["setup","wasmFunc","sliceImplCPU","concatImplCPU","supportsFullBroadcas
t","setupFunc","kernelFunc","rangeImplCPU","require$$0","require$$1","require$$2","global","require$$3","requir

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AQ;QACR,QAAQ;QACR,QAAQ;QACR,OAAO;QACP,QAAQ;KACT,CAAC,CAAC;AACL,CAAC;SAEe,SAAS ,CACrB,IAC0E;IAE5E,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;;;IAGtC, MAAM,CAAC,YAAY,EAAE,IAAI,CAAC,GAAG,iBAaIB,CAAC,MAAM,CAAC,CAAC,CAAC,KAAK,EAAE, KAAK,CAAC,IAAI,CAAC,CAAC;IAE3E,IAAI,UAAU,GAAG,IAAI,CAAC;IACtB,KAAK,IAAI,CAAC,GAAG, CAAC,EAAE,CAAC,GAAG,IAAI,CAAC,MAAM,EAAE,CAAC,EAAE,EAAE;QACpC,IAAI,IAAI,CAAC,CAA C,CAAC,KAAK,CAAC,EAAE;YACjB,UAAU,GAAG,KAAK,CAAC;SACpB;KACf;IACD,MAAM,QAAQ,GAA G,eAAe,CAAC,MAAM,CAAC,CAAC,CAAC,KAAK,EAAE,KAAK,CAAC,IAAI,CAAC,CAAC;IAC7D,MAAM, CAAC,GAAG;QACR,MAAM,EAAE,MAAM,CAAC,CAAC,CAAC,MAAM;QACvB,KAAK,EAAE,YAAY;QAC nB,KAAK,EAAE,MAAM,CAAC,CAAC,CAAC,KAAK;KACtB,CAAC;IAEF,IAAI,UAAU,EAAE;QACd,MAAM ,MAAM,GAAG,QAAQ,CAAC,EAAC,MAAM,EAAE,OAAO,EAAC,CAAC,CAAC;QAC3C,MAAM,CAAC,KAA K,GAAG,QAAQ,CAAC;QACxB,OAAO,MAAM,CAAC;KACf;IAED,MAAM,GAAG,GAAG,OAAO,CAAC,UA AU,CAAC,QAAQ,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;IACID,MAAM,GAAG,GAAG,OAAO,CAAC,SA AS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,MAAM,KAAK,GAAG,OA AO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IACnD,MAAM,SA AS,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,IAAI,CAAC,CAAC,MAAM,CAAC,CAAC;IAC9D,MAAM, WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,C AAC;IAEnE,aAAa,CACT,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,QAAQ,CA AC,CAAC,CAAC,KAAK,CAAC,EAAE,KAAK,EAAE,SAAS,EACtE,IAAI,CAAC,MAAM,CAAC,CAAC;IACjB, OAAO,GAAG,CAAC;AACb,CAAC;AAED,SAAS,eAAe,CAAC,OAAiB,EAAE,IAAc;IACxD,MAAM,QAAQ,GA AG,IAAI,KAAK,CAAC,OAAO,CAAC,MAAM,CAAC,CAAC;IAC3C,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE, CAAC,GAAG,QAAQ,CAAC,MAAM,EAAE,CAAC,EAAE,EAAE;QACxC,QAAQ,CAAC,CAAC,CAAC,GAAG, OAAO,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;KAChC;IACD,OAAO,QAAQ,CAAC;AACIB,CAAC;A AED,SAAS,iBAaIB,CACtB,KAAe,EAAE,IAAc;IACjC,MAAM,QAAQ,GAAa,EAAE,CAAC;IAC9B,MAAM,OA AO,GAAa,EAAE,CAAC;IAC7B,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,KAAK,CAAC,MAA M,EAAE,EAAE,CAAC,EAAE;QACrC,IAAI,KAAK,CAAC,CAAC,CAAC,KAAK,CAAC,EAAE;YACIB,QAAQ, CAAC,IAAI,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC,CAAC;SACzB;QACD,IAAI,KAAK,CAAC,IAAI,CAA C,CAAC,CAAC,CAAC,KAAK,CAAC,EAAE;YACxB,OAAO,CAAC,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,C AAC,CAAC;SACvB;KACf;IACD,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,OAAO,CAAC,MAA M,EAAE,EAAE,CAAC,EAAE;QACvC,IAAI,SAAS,GAAG,CAAC,CAAC,CAAC;QACnB,KAAK,IAAI,CAAC,G AAG,CAAC,EAAE,CAAC,GAAG,OAAO,CAAC,MAAM,EAAE,EAAE,CAAC,EAAE;YACvC,IAAI,OAAO,CA AC,CAAC,CAAC,IAAI,CAAC;iBACd,SAAS,KAAK,CAAC,CAAC,IAAI,OAAO,CAAC,SAAS,CAAC,GAAG,O AAO,CAAC,CAAC,CAAC,CAAC,EAAE;gBACzD,SAAS,GAAG,CAAC,CAAC;aACf;SACF;QACD,OAAO,CA AC,SAAS,CAAC,GAAG,CAAC,CAAC;KACxB;IACD,OAAO,CAAC,QAAQ,EAAE,OAAO,CAAC,CAAC;AAC 7B,CAAC;AAEM,MAAM,eAAe,GAAiB;IAC3C,UAAU,EAAE,SAAS;IACrB,WAAW,EAAE,MAAM;IACnB,UA AU,EAAE,SAA6B;IACzC,SAAS,EAAEA,OAAK;CACjB;;;ACtHD;;;;;;;AAqBA;;;;;;;SAQgB,uBAaUB,CA CnC,CAAa,EAAE,IAAqB,EAAE,OAAoB;IAM5D,MAAM,MAAM,GAAG,CAAC,CAAC,KAAK,CAAC;IACvB, MAAM,KAAK,GAAG,CAAC,CAAC,KAAK,CAAC,MAAM,CAAC;IAE7B,MAAM,YAAY,GAAG,IAAI,CAAC, cAAc,CAAC,IAAI,EAAE,MAAM,CAAC,CAAC;IACvD,IAAI,IAAI,GAAG,YAAY,CAAC;IACxB,MAAM,YAA Y,GAAG,YAAY,CAAC,kBAaKB,CAAC,IAAI,EAAE,KAAK,CAAC,CAAC;IACIE,IAAI,WAAW,GAAG,IAAI,C AAC;IACvB,IAAI,kBAaKB,GAAG,KAAK,CAAC;IAC/B,IAAI,YAAY,IAAI,IAAI,EAAE;QACxB,MAAM,QAA Q,GAAa,IAAI,KAAK,CAAC,KAAK,CAAC,CAAC;QAC5C,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,G AAG,QAAQ,CAAC,MAAM,EAAE,CAAC,EAAE,EAAE;YACxC,QAAQ,CAAC,CAAC,CAAC,GAAG,MAAM, CAAC,YAAY,CAAC,CAAC,CAAC,CAAC;SACvC;QAED,IAAI,GAAG,YAAY,CAAC,gBAAgB,CAAC, IAAI,CAAC,MAAM,EAAE,KAAK,CAAC,CAAC;QACzD,WAAW;YACP,SAAS,CAAC,EAAC,MAAM,EAAE, EAAC,CAAC,EAAC,EAAE,KAAK,EAAE,EAAC,IAAI,EAAE,YAAY,EAAC,EAAE,OAAO,EAAC,CAAC,CAA C;QAEEnE,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,MAAM,CAAC,CA AC,EAAE,CAAC;QAC/C,MAAM,YAAY,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,WAAW,CAAC,M AAM,CAAC,CAAC,EAAE,CAAC;QACIE,IAAI,YAAY,KAAK,GAAG,EAAE;YACxB,kBAaKB,GAAG,IAAI,C



AAC;SAC3B;KACF;IAED,OAAO,EAAC,UAAU,EAAE,WAAW,EAAE,YAA,Y,EAAE,IAAI,EAAE,kBAaKB,EAAC,CAAC;AAC3E;;AC9DA;;;;;;;AAuBA,IAAI,OAAiE,CAAC;AAEtE,SAASA,OAAK,CAAC,OAAoB;IACjC,OAAO,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,GAAG,EAAE,IAAI,WAAW,CAAC,wBAAwB,CAAC,CAAC,CAAC;AAC/E,CAAC;AAED,SAAS,GAAG,CAAC,IAAgE;IAE3E,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,IAAI,EAAE,QAAQ,EAAC,GAAG,KAAK,CAAC;IAC/B,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;IACnB,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,IAAI,OAAO,GAAG,GAAG,CAAC;IACiB,IAAI,KAAK,GAAG,CAAC,CAAC;IAEd,MAAM,EAAC,UAAU,EAAE,IAAI,EAAE,YAA,Y,EAAE,kBAaKB,EAAC,GACtD,uBAAuB,CAAC,CAAC,EAAE,IAAI,EAAE,OAAO,CAAC,CAAC;IAE9C,IAAI,kBAaKB,EAAE;QACtB,MAAM,YAA,Y,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACjE,KAAK,GAAG,UAAU,CAAC;QACnB,OAAO,GAAG,YAA,Y,CAAC;KACxB;IAED,MAAM,SAAS,GAAG,KAAK,CAAC,KAAK,CAAC,MAAM,CAAC;IACrC,YAA,Y,CAAC,0BAA0B,CAAC,KAAK,EAAE,IAAI,EAAE,SAAS,CAAC,CAAC;IAChE,MAAM,CAAC,QAAQ,EAAE,WAAW,CAAC,GACzB,YAA,Y,CAAC,yBAaYB,CAAC,KAAK,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC;IAC9D,MAAM,UAAU,GAAG,IAAI,CAAC,aAAa,CAAC,WAAW,CAAC,CAAC;IAEnD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,QAAQ,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;IACiD,IAAI,IAAI,CAAC,aAAa,CAAC,KAAK,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;QACzC,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACnD,OAAO,CAAC,OAAO,EAAE,UAAU,EAAE,KAAK,CAAC,CAAC;KACrC;IAED,IAAI,kBAaKB,EAAE;;QAEtB,OAAO,CAAC,WAAW,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;KACxC;IAED,IAAI,QAAQ,EAAE;;QAEZ,MAAM,QAAQ,GAAG,YAA,Y,CAAC,oBAAoB,CAAC,GAAG,CAAC,KAAK,EAAE,YAA,Y,CAAC,CAAC;QAC5E,GAAG,CAAC,KAAK,GAAG,QAAQ,CAAC;KACtB;IAED,OAAO,GAAG,CAAC;AACb,CAAC;AAEM,MAAM,SAAS,GAaiB;IACrC,UAAU,EAAE,GAAG;IACf,WAAW,EAAE,MAAM;IACnB,SAAS,EAAEA,OAAK;IACb,UAAU,EAAE,GAauB;CACpC;;AC9ED;;;;;;;AAuBA,IAAI,OAAiE,CAAC;AAEtE,SAASA,OAAK,CAAC,OAAoB;IACjC,OAAO,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,GAAG,EAAE,IAAI,WAAW,CAAC,wBAAwB,CAAC,CAAC,CAAC;AAC/E,CAAC;AAED,SAAS,GAAG,CAAC,IAAgE;IAE3E,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,IAAI,EAAE,QAAQ,EAAC,GAAG,KAAK,CAAC;IAC/B,MAAM,EAAC,CAAC,EAAC,GAAG,MAAM,CAAC;IACnB,MAAM,GAAG,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;IAC/C,IAAI,OAAO,GAAG,GAAG,CAAC;IACiB,IAAI,KAAK,GAAG,CAAC,CAAC;IAEd,MAAM,EAAC,UAAU,EAAE,IAAI,EAAE,YAA,Y,EAAE,kBAaKB,EAAC,GACtD,uBAAuB,CAAC,CAAC,EAAE,IAAI,EAAE,OAAO,CAAC,CAAC;IAE9C,IAAI,kBAaKB,EAAE;QACtB,MAAM,YAA,Y,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACjE,KAAK,GAAG,UAAU,CAAC;QACnB,OAAO,GAAG,YAA,Y,CAAC;KACxB;IAED,MAAM,SAAS,GAAG,KAAK,CAAC,KAAK,CAAC,MAAM,CAAC;IACrC,YAA,Y,CAAC,0BAA0B,CAAC,KAAK,EAAE,IAAI,EAAE,SAAS,CAAC,CAAC;IAChE,MAAM,CAAC,QAAQ,EAAE,WAAW,CAAC,GACzB,YAA,Y,CAAC,yBAaYB,CAAC,KAAK,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC;IAC9D,MAAM,UAAU,GAAG,IAAI,CAAC,aAAa,CAAC,WAAW,CAAC,CAAC;IAEnD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,CAAC,QAAQ,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC;IACiD,IAAI,IAAI,CAAC,aAAa,CAAC,KAAK,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;QACzC,MAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QACnD,OAAO,CAAC,OAAO,EAAE,UAAU,EAAE,KAAK,CAAC,CAAC;KACrC;IAED,IAAI,kBAaKB,EAAE;;QAEtB,OAAO,CAAC,WAAW,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;KACxC;IAED,IAAI,QAAQ,EAAE;;QAEZ,MAAM,QAAQ,GAAG,YAA,Y,CAAC,oBAAoB,CAAC,GAAG,CAAC,KAAK,EAAE,YAA,Y,CAAC,CAAC;QAC5E,GAAG,CAAC,KAAK,GAAG,QAAQ,CAAC;KACtB;IAED,OAAO,GAAG,CAAC;AACb,CAAC;AAEM,MAAM,SAAS,GAaiB;IACrC,UAAU,EAAE,GAAG;IACf,WAAW,EAAE,MAAM;IACnB,SAAS,EAAEA,OAAK;IACb,UAAU,EAAE,GAauB;CACpC;;AC9ED;;;;;;;AAwBA,IAAI,UAESB,CAAC;AAE3B,SAASD,OAAK,CAAC,OAAoB;IACjCC,UAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,MAAM,EAAE,IAAI,aAAa;QACrD,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ;KACT,CAAC,CAAC;AACL,CAAC;AAED,SAAS,MAAM,CACX,IAAsE;IACxE,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,E

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K,GAAG,CAAC,CAAC;IAEd,MAAM,EAAC,UAAU,EAAE,IAAI,EAAE,kBAakB,EAAC,GACxC,uBAAuB,CA  
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D;:::;AAuBA,IAAI,wBAQQ,CAAC;AAEb,SAASA,OAAK,CAAC,OAAoB;IACjC,wBAAwB;QACpB,OA  
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No license file was found, but licenses were detected in source scan.

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- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/RotateWithOffset.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Round.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/SelectV2.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/DepthToSpace.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/batch\_mat\_mul\_impl.h
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Softmax.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prod.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/TopK.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sqrt.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Conv2DBackpropInput.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Step.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/BatchMatMul.cc
- \* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-

```
wasm/src/cc/kernels/FlipLeftRight.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/kernels/StridedSlice.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/kernels/Softmax.h
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/kernels/NotEqual.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/kernels/NonMaxSuppressionV4.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Neg.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/batch_mat_mul_impl.cc
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/src/cc/kernels/PadV2_test.cc
```

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```
{"version":3,"file":"Cos.js","sourceRoot":"","sources":["../src/kernels/Cos.ts"],"names":[],"mappings":"AAAA;;;;
;;;;;;;GAeG;AAEH,OAAO,EAAC,GAAG,EAAe,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EA
AC,MAAM,gBAAgB,CAAC;AAEvD,MAAM,CAAC,MAAM,SAAS,GAaiB,uBAAuB,CAAC,GAAG,CAAC,CA
AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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```

```
=====\n
*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n\n}}
```

Found in path(s):

```
* /opt/cola/permits/1234600203_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-
wasm/dist/kernels/Cos.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"Cosh.js","sourceRoot":"","sources":["../src/kernels/Cosh.ts"],"names":[],"mappings":"AAAA;
;;;;;;;GAeG;AACH,OAAO,EAAC,IAAI,EAAe,MAAM,uBAAuB,CAAC;AAEzD,OAAO,EAAC,uBAAuB,EA
AC,MAAM,gBAAgB,CAAC;AAEvD,MAAM,CAAC,MAAM,UAAU,GAaiB,uBAAuB,CAAC,IAAI,CAAC,CAA
C","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n *
```

```
=====\n
*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\n\nimport { createUnaryKernelConfig } from
'/unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n\n}}
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.js.map

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```
{ "version":3,"file":"Range.js","sourceRoot":"","sources":["../../src/kernels/Range.ts"],"names":[],"mappings":"AAA
A;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,KAAK,EAAYB,MAAM,uBAAuB,CAAC;AAG9F,OAAO,EAAC,YAA
Y,EAAC,MAAM,wBAAwB,CAAC;AAEpD,MAAM,CAAC,MAAM,KAAK,GACd,CAAC,IAA+C,EAAC,EAAE;I
AC9D,MAAM,EAAC,OAAO,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IAC9B,MAAM,EAAC,KAAK,EAAE,IA
AI,EAAE,IAAI,EAAE,KAAK,EAAC,GAAG,KAAK,CAAC;IACzC,MAAM,MAAM,GAAG,YAAY,CAAC,KAA
K,EAAE,IAAI,EAAE,IAAI,EAAE,KAAK,CAAC,CAAC;IAEtD,MAAM,GAAG,GAAG,OAAO,CAAC,UAAU,C
AAC,CAAC,MAAM,CAAC,MAAM,CAAC,EAAE,KAAK,CAAC,CAAC;IACvD,MAAM,OAAO,GAAG,OAAO,
CAAC,kBAaKB,CAAC,GAAG,CAAC,CAAC;IACbD,OAAO,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC;IACp
B,OAAO,GAAG,CAAC;AACb,CAAC,CAAC;AAEN,MAAM,CAAC,MAAM,WAAW,GAAiB;IACvC,UAAU,EA
AE,KAAK;IACjB,WAAW,EAAE,MAAM;IACnB,UAAU,EAAE,KAAyB;CACtC,CAAC","sourcesContent":["/**\n
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 *
 * =====\n
 * \n\nimport { KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo } from '@tensorflow/tfjs-core';\n\nimport
 { BackendWasm } from '../backend_wasm';\n\nimport { rangeImplCPU } from '../kernel_utils/shared';\n\nexport const
 range =\n (args: { backend: BackendWasm, attrs: RangeAttrs }): TensorInfo => {\n const { backend, attrs } =
args;\n const { start, stop, step, dtype } = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n
const out = backend.makeOutput([values.length], dtype);\n const outVals =
backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as { } as
KernelFunc\n};\n"}]
```

Found in path(s):

\* /opt/cola/permits/1234600203\_1638277742.68/0/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Range.js.map

## 1.67 swagger-annotations 1.5.22

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\*/

package io.swagger.annotations;

import java.lang.annotation.ElementType;

import java.lang.annotation.Retention;

import java.lang.annotation.RetentionPolicy;

import java.lang.annotation.Target;

/\*\*

\* License metadata available within the info section of a Swagger definition, see

\* <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md#licenseObject>

\*

\* @since 1.5.0

\*/

@Target(ElementType.ANNOTATION\_TYPE)

@Retention(RetentionPolicy.RUNTIME)

public @interface License {

```

/**
 * The name of the license.
 *
 * @return the name of the license
 */
String name();

/**
 * An optional URL for the license.
 *
 * @return an optional URL for the license.
 */
String url() default "";
}

```

## 1.68 hikaricp 3.4.5

### 1.68.1 Available under license :

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```

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```

Found in path(s):

```

* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-
jar/com/zaxxer/hikari/pool/ProxyResultSet.java
* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-
jar/com/zaxxer/hikari/pool/ProxyLeakTaskFactory.java
* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-
jar/com/zaxxer/hikari/pool/ProxyConnection.java
* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-
jar/com/zaxxer/hikari/util/JavassistProxyFactory.java
* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/util/FastList.java
* /opt/cola/permits/1097982284_1602212316.23/0/hikaricp-3-4-5-sources-1-

```



jar/com/zaxxer/hikari/util/DriverDataSource.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/metrics/prometheus/HikariCPCollector.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/pool/ProxyLeakTask.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/HikariConfig.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/pool/ProxyFactory.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/util/SuspendResumeLock.java  
\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-  
jar/com/zaxxer/hikari/util/ConcurrentBag.java  
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jar/com/zaxxer/hikari/pool/PoolBase.java  
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- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/pool/HikariPool.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/MetricsTrackerFactory.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/HikariJNDIFactory.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/dropwizard/CodaHaleMetricsTracker.java

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- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/HikariDataSource.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/HikariPoolMXBean.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/util/PropertyElf.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/pool/ProxyPreparedStatement.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/HikariConfigMXBean.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/hibernate/HikariConnectionProvider.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/dropwizard/CodahaleMetricsTrackerFactory.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/prometheus/PrometheusMetricsTracker.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/pool/ProxyCallableStatement.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/util/UtilityElf.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/prometheus/PrometheusHistogramMetricsTracker.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/pool/ProxyStatement.java
- \* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/hibernate/HikariConfigurationUtil.java

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\* /opt/cola/permits/1097982284\_1602212316.23/0/hikaricp-3-4-5-sources-1-jar/com/zaxxer/hikari/metrics/dropwizard/CodahaleHealthChecker.java  
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## 1.70 pcre 10.34-7

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Written by: Philip Hazel  
Email local part: ph10  
Email domain: cam.ac.uk

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## 1.74 inja 3.1.0

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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
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```
/**
* XSLT-driven View that allows for response context to be rendered as the
* result of an XSLT transformation.
*
* <p>The XSLT Source object is supplied as a parameter in the model and then
* { @link #locateSource detected } during response rendering. Users can either specify
* a specific entry in the model via the { @link #setSourceKey sourceKey } property or
* have Spring locate the Source object. This class also provides basic conversion
* of objects into Source implementations. See { @link #getSourceTypes() here }
* for more details.
*
* <p>All model parameters are passed to the XSLT Transformer as parameters.
* In addition the user can configure { @link #setOutputProperties output properties }
```



\* to be passed to the Transformer.

\*

\* @author Rob Harrop

\* @author Juergen Hoeller

\* @since 2.0

\*/

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/xslt/XsltView.java

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/TagIdGenerator.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/AbstractUrlViewController.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/LastModified.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/support/RedirectAttributes.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/OptionWriter.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/ConversionServiceExposingInterceptor.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/SmartView.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/condition/MediaTypeExpression.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/SimpleControllerHandlerAdapter.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-

jar/org/springframework/web/servlet/handler/AbstractDetectingUrlHandlerMapping.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/handler/SimpleServletHandlerAdapter.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/tiles3/SpringBeanPreparerFactory.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/HttpRequestHandlerAdapter.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/RadioButtonsTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/tiles3/AbstractSpringPreparerFactory.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/ParamAware.java  
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jar/org/springframework/web/servlet/view/tiles3/TilesConfigurer.java  
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jar/org/springframework/web/servlet/mvc/method/annotation/RequestAttributeMethodArgumentResolver.java  
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jar/org/springframework/web/servlet/config/ViewControllerBeanDefinitionParser.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
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jar/org/springframework/web/servlet/view/tiles3/SpringWildcardServletTilesApplicationContext.java  
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jar/org/springframework/web/servlet/view/JstlView.java  
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jar/org/springframework/web/servlet/mvc/method/annotation/RedirectAttributesMethodArgumentResolver.java  
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jar/org/springframework/web/servlet/mvc/method/annotation/HttpHeadersReturnValueHandler.java

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/InternalResourceView.java  
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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/HandlerInterceptorAdapter.java  
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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/Param.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/EnableWebMvc.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/RedirectViewControllerRegistration.java

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/theme/SessionThemeResolver.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/SimpleServletPostProcessor.java

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/ViewControllerRegistration.java

\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/support/JspAwareRequestContext.java

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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-

jar/org/springframework/web/servlet/mvc/method/annotation/CallableMethodReturnValueHandler.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/annotation/PathVariableMapMethodArgumentResolver.java  
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jar/org/springframework/web/servlet/theme/FixedThemeResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/config/annotation/ResourceChainRegistration.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/annotation/AsyncTaskMethodReturnValueHandler.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/annotation/ModelAndViewResolverMethodReturnValueHandler.java  
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\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/i18n/SessionLocaleResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/support/JstlUtils.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/config/annotation/ResourceHandlerRegistration.java  
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jar/org/springframework/web/servlet/tags/form/HiddenInputTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/i18n/AbstractLocaleResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/theme/ThemeChangeInterceptor.java  
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- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/resource/ResourceUrlProvider.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/AsyncSupportConfigurer.java
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- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/resource/VersionResourceResolver.java
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- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/HandlerExecutionChain.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/UrlBasedViewResolver.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/resource/PathResourceResolver.java
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 */
/**
 * A contract for inspecting and potentially modifying request data values such
 * as URL query parameters or form field values before they are rendered by a
 * view or before a redirect.
 *
 * <p>Implementations may use this contract for example as part of a solution
 * to provide data integrity, confidentiality, protection against cross-site
 * request forgery (CSRF), and others or for other tasks such as automatically
 * adding a hidden field to all forms and URLs.
 *
 * <p>View technologies that support this contract can obtain an instance to
 * delegate to via { @link RequestContext#getRequestDataValueProcessor()}.
 *
 * @author Rossen Stoyanchev
 * @since 3.1
 */
```

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- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/RequestResponseBodyMethodProcessor.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/AbstractController.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/RequestResponseBodyAdviceChain.java
- \* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-

jar/org/springframework/web/servlet/view/json/AbstractJackson2View.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractCheckedElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/feed/AbstractAtomFeedView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/DefaultServletHttpRequestHandler.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/TagWriter.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/config/ViewResolversBeanDefinitionParser.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/ModelAndViewDefiningException.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/BindTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/ResourceTransformerSupport.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractHtmlElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/TransformedResource.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/EscapeBodyTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/CheckboxesTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/document/AbstractPdfView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/ContentNegotiatingViewResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/ErrorsTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/feed/AbstractFeedView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/RadioButtonTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/UrlTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/FormTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/theme/CookieThemeResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/HandlerExceptionResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/ButtonTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/ResourceResolverChain.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-

jar/org/springframework/web/servlet/tags/ThemeTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/AbstractHandlerMethodAdapter.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/json/MappingJackson2JsonView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/TextareaTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/BeanNameViewResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/condition/AbstractMediaTypeExpression.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/handler/SimpleMappingExceptionResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/BindErrorsTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/document/AbstractPdfStamperView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractFormTag.java  
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jar/org/springframework/web/servlet/tags/ParamTag.java  
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jar/org/springframework/web/servlet/mvc/condition/AbstractNameValueExpression.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/CheckboxTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/ViewResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/support/BindStatus.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/MessageTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/xml/MarshallingView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/support/RequestContextUtils.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractSingleCheckedElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/LabelTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/config/FreeMarkerConfigurerBeanDefinitionParser.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/annotation/ServletRequestMethodArgumentResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/freemarker/FreeMarkerView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/OptionsTag.java  
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jar/org/springframework/web/servlet/tags/EditorAwareTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractHtmlInputElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/ValueFormatter.java  
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jar/org/springframework/web/servlet/tags/TransformTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractMultiCheckedElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/xml/MappingJackson2XmlView.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/support/AbstractAnnotationConfigDispatcherServletInitializer.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/HtmlEscapeTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/NestedPathTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/DefaultResourceTransformerChain.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/GzipResourceResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/ResourceTransformerChain.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/view/ResourceBundleViewResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/HandlerAdapter.java  
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jar/org/springframework/web/servlet/support/AbstractDispatcherServletInitializer.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/SelectedValueComparator.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/config/annotation/CorsRegistration.java  
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jar/org/springframework/web/servlet/view/XmlViewResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/AbstractHtmlElementBodyTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/mvc/method/annotation/AbstractMessageConverterMethodArgumentResolver.  
java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/handler/HandlerMethodMappingNamingStrategy.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/handler/MappedInterceptor.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/tags/form/InputTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-  
jar/org/springframework/web/servlet/resource/DefaultResourceResolverChain.java



\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/SelectTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/AbstractDataBoundFormElementTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/HandlerMapping.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/tags/form/OptionTag.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/script/RenderingContext.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/groovy/GroovyMarkupConfigurer.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/ResponseBodyEmitter.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/ServletRequestMethodArgumentResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/handler/HandlerMappingIntrospector.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/TilesConfigurerBeanDefinitionParser.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/ResponseBodyAdvice.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/view/freemarker/FreeMarkerConfigurer.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/ScriptTemplateConfigurerBeanDefinitionParser.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/config/annotation/InterceptorRegistry.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/View.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/method/annotation/MatrixVariableMethodArgumentResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/HttpServletBean.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/support/DefaultHandlerExceptionResolver.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/mvc/condition/CompositeRequestCondition.java  
\* /opt/cola/permits/1135888060\_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-jar/org/springframework/web/servlet/support/WebContentGenerator.java  
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* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
jar/org/springframework/web/servlet/view/freemarker/FreeMarkerViewResolver.java
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```
* /opt/cola/permits/1135888060_1613626348.76/0/spring-webmvc-5-2-8-release-sources-2-
jar/org/springframework/web/servlet/theme/AbstractThemeResolver.java
```

## 1.77 atomicwrites 1.3.0

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## 1.78 hdrhistogram 2.1.12

### 1.78.1 Available under license :

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Manifest-Version: 1.0

Bnd-LastModified: 1575980548657

Build-Jdk: 1.8.0\_232

Built-By: gil

Bundle-Description: HdrHistogram supports the recording and analyzing sampled data value counts across a configurable integer value range with configurable value precision within the range. Value precision is expressed as the number of significant digits in the value recording, and provides control over value quantization behavior across the value range and the subsequent value resolution at any given level.

Bundle-License: <http://creativecommons.org/publicdomain/zero/1.0/>, <https://opensource.org/licenses/BSD-2-Clause>

Bundle-ManifestVersion: 2

Bundle-Name: HdrHistogram

Bundle-SymbolicName: org.hdrhistogram.HdrHistogram

Bundle-Version: 2.1.12

Created-By: Apache Maven Bundle Plugin

Export-Package: org.HdrHistogram;version="2.1.12",org.HdrHistogram.packagedarray;version="2.1.12"

Implementation-Title: HdrHistogram

Implementation-Vendor-Id: org.hdrhistogram

Implementation-Version: 2.1.12

Require-Capability: osgi.ee;filter="(&(osgi.ee=JavaSE)(version=1.7))"

Specification-Title: HdrHistogram

Specification-Version: 2.1.12

Tool: Bnd-2.3.0.201405100607

Found in path(s):

\* /opt/cola/permits/1183539882\_1627427044.77/0/hdrhistogram-2-1-12-2-jar/META-INF/MANIFEST.MF

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# 1.79 apache-http-server 2.4.52

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Written by Adam Twiss (adam@zeus.co.uk). March 1996

Thanks to the following people for their input:

Mike Belshe (mbelshe@netscape.com)

Michael Campanella (campanella@stevms.enet.dec.com)

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* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannelOption.java
* /opt/ws_local/PERMITS_SQL/1075084034_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/package-info.java
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sources-jar/netty\_unix\_filedescriptor.h  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/netty\_unix\_filedescriptor.c  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/io/netty/channel/unix/NativeInetAddress.java  
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\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
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\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
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sources-jar/netty\_unix\_errors.c  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/io/netty/channel/unix/FileDescriptor.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/io/netty/channel/unix/DomainSocketReadMode.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/io/netty/channel/unix/Errors.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-  
sources-jar/io/netty/channel/unix/UnixChannel.java

No license file was found, but licenses were detected in source scan.

/\*

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\*/

Found in path(s):

- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/PeerCredentials.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/SocketWritableByteChannel.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty\_unix\_util.c
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty\_unix\_limits.h
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty\_unix\_util.h
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/ErrorsStaticallyReferencedJniMethods.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/netty\_unix\_limits.c
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/Limits.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084034\_1596044782.67/0/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/LimitsStaticallyReferencedJniMethods.java

# 1.81 procps 3.2.8

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## 1.82 apr-util 1.6.1

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- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ParameterizedType.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Utils.java
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- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexWriterImpl.java
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- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/VoidType.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexReaderImpl.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ArrayType.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexWriterV2.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ClassExtendsTypeTarget.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodParameterTypeTarget.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodInternal.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/WildcardType.java
- \* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-

jar/org/jboss/jandex/GenericSignatureParser.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/TypeVariable.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/UnresolvedTypeVariable.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/IndexReaderV2.java  
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\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/PackedDataOutputStream.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/ClassInfo.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/IndexWriter.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/DotName.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/FieldInternal.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/FieldInfo.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/NameTable.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/CompositeIndex.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/IndexWriterV1.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-  
jar/org/jboss/jandex/IndexView.java



\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/StrongInternPool.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Indexer.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/JarIndexer.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/JandexAntTask.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodInfo.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/ClassType.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexReaderV1.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Result.java  
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\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/MethodParameterInfo.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/UnsupportedVersion.java  
\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/AnnotationValue.java  
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\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/PrimitiveType.java  
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\* /opt/ws\_local/PERMITS\_SQL/1063930911\_1593103343.43/0/jandex-2-1-3-final-sources-jar/org/jboss/jandex/Type.java

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9. **Accepting Warranty or Additional Liability.** While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

## END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[ ]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

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This product includes software developed by  
The Apache Software Foundation (<http://www.apache.org/>).

## 1.88 sqlite 3.31.1-4ubuntu0.2

### 1.88.1 Available under license :

No license file was found, but licenses were detected in source scan.

<dd><p>The psow query parameter works with the default windows and unix VFSes but might be a no-op for other proprietary or non-standard VFSes.

<dd><p>One might, for example, want to query all objects that overlap with the 35th parallel: SELECT id FROM demo\_index WHERE maxY>=35.0 AND minY<=35.0; But, generally speaking, the more constraints that the R\*Tree module has to work with, and the smaller the bounding box, the faster the results will come back. 3.4. Roundoff Error By default, coordinates are stored in an R\*Tree using 32-bit floating point values. When a coordinate cannot be exactly represented by a 32-bit floating point number, the lower-bound coordinates are rounded down and the upper-bound coordinates are rounded up. Thus, bounding boxes might be slightly larger than specified, but will never be any smaller. This is exactly what is desired for doing the more common "overlapping" queries where the application wants to find every entry in the R\*Tree that overlaps a query bounding box. Rounding the entry bounding boxes outward might cause a few extra entries to appear in an overlapping query if the edge of the entry bounding box corresponds to an edge of the query bounding box. But the overlapping query will never miss a valid table entry. However, for a "contained-within" style query, rounding the bounding boxes outward might

cause some entries to be excluded from the result set if the edge of the entry bounding box corresponds to the edge of the query bounding box. To guard against this, applications should expand their contained-within query boxes slightly (by 0.000012%) by rounding down the lower coordinates and rounding up the top coordinates, in each dimension.

### 3.5. Reading And Writing At The Same Time

It is the nature of the Guttman R-Tree algorithm that any write might radically restructure the tree, and in the process change the scan order of the nodes. For this reason, it is not generally possible to modify the R-Tree in the middle of a query of the R-Tree. Attempts to do so will fail with a `SQLITE_LOCKED` "database table is locked" error. So, for example, suppose an application runs one query against an R-Tree like this: `SELECT id FROM demo_index WHERE maxY >= 35.0 AND minY <= 35.0`; Then for each "id" value returned, suppose the application creates an `UPDATE` statement like the following and binds the "id" value returned against the "?1" parameter: `UPDATE demo_index SET maxY = maxY + 0.5 WHERE id = ?1`; Then the `UPDATE` might fail with an `SQLITE_LOCKED` error. The reason is that the initial query has not run to completion. It is remembering its place in the middle of a scan of the R-Tree. So an update to the R-Tree cannot be tolerated as this would disrupt the scan. It is also possible to express this kind of simultaneous read and write on an R-Tree within a single query, for example if an `UPDATE` statement tries to change the value of one row of the R-Tree based on a complicated query from another row of the same R-Tree, perhaps something like this: `UPDATE demo_index SET maxY = (SELECT max(maxX) FROM demo_index AS x2 WHERE x2.maxY > demo_index.x2) WHERE maxY >= 35.0 AND minY <= 35.0`; This is a limitation of the R-Tree extension only. Ordinary tables in SQLite are able to read and write at the same time. Other virtual tables might (or might not) also that capability. And R-Tree can appear to read and write at the same time in some circumstances, if it can figure out how to reliably run the query to completion before starting the update. But you shouldn't count on that for every query. Generally speaking, it is best to avoid running queries and updates to the same R-Tree at the same time. If you really need to update an R-Tree based on complex queries against the same R-Tree, it is best to run the complex queries first and store the results in a temporary table, then update the R-Tree based on the values stored in the temporary table.

### 4. Using R\*Trees Effectively

For SQLite versions prior to 3.24.0 (2018-06-04), the only information that an R\*Tree index stores about an object is its integer ID and its bounding box. Additional information needs to be stored in separate tables and related to the R\*Tree index using the primary key. For the example above, one might create an auxiliary table as follows: `CREATE TABLE demo_data( id INTEGER PRIMARY KEY, -- primary key objname TEXT, -- name of the object objtype TEXT, -- object type boundary BLOB -- detailed boundary of object );` In this example, the `demo_data.boundary` field is intended to hold some kind of binary representation of the precise boundaries of the object. The R\*Tree index only holds an axis-aligned rectangular boundary for the object. The R\*Tree boundary is just an approximation of the true object boundary. So what typically happens is that the R\*Tree index is used to narrow a search down to a list of candidate objects and then more detailed and expensive computations are done on each candidate to find if the candidate truly meets the search criteria. Key Point: An R\*Tree index does not normally provide the exact answer but merely reduces the set of potential answers from millions to dozens. Suppose the `demo_data.boundary` field holds some proprietary data description of a complex two-dimensional boundary for an object and suppose that the application has used the `sqlite3_create_function()` interface to created application-defined functions "contained\_in" and "overlaps" accepting two `demo_data.boundary` objects and return true or false. One may assume that "contained\_in" and "overlaps" are relatively slow functions that we do not want to invoke too frequently. Then an efficient way to find the name of all objects located within the North Carolina 12th District, one may be to run a query like this: `SELECT objname FROM demo_data, demo_index WHERE demo_data.id=demo_index.id AND contained_in(demo_data.boundary, :boundary) AND minX >= -81.0 AND maxX <= -79.6 AND minY >= 35.0 AND maxY >= 36.2`; In the query above, one would presumably bind the binary BLOB description of the precise boundary of the 12th district to the ":boundary" parameter. Notice how the query above works: The R\*Tree index runs in the outer loop to find entries that are contained within the bounding box of longitude -81..-79.6 and latitude 35.0..36.2. For each object identifier found, SQLite looks up the corresponding entry in the `demo_data` table. It then uses the boundary field from the `demo_data` table as a parameter to the `contained_in()` function and if that function returns true, the `objname` field from the `demo_data` table is returned as the next row of query result. One would get the same answer without the use of the R\*Tree index using the

following simpler query: SELECT objname FROM demo\_data WHERE contained\_in(demo\_data.boundary, :boundary); The problem with this latter query is that it must apply the contained\_in() function to millions of entries in the demo\_data table. The use of the R\*Tree in the penultimate query reduces the number of calls to contained\_in() function to a small subset of the entire table. The R\*Tree index did not find the exact answer itself, it merely limited the search space.

4.1. Auxiliary Columns Beginning with SQLite version 3.24.0 (2018-06-04), r-tree tables can have auxiliary columns that store arbitrary data. Auxiliary columns can be used in place of secondary tables such as "demo\_data". Auxiliary columns are marked with a "+" symbol before the column name. Auxiliary columns must come after all of the coordinate boundary columns. There is a limit of no more than 100 auxiliary columns. The following example shows an r-tree table with auxiliary columns that is equivalent to the two tables "demo\_index" and "demo\_data" above: CREATE VIRTUAL TABLE demo\_index2 USING rtree( id, -- Integer primary key minX, maxX, -- Minimum and maximum X coordinate minY, maxY, -- Minimum and maximum Y coordinate +objname TEXT, -- name of the object +objtype TEXT, -- object type +boundary BLOB -- detailed boundary of object );

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/requirements.html  
No license file was found, but licenses were detected in source scan.

```
<html>
<head>
<title>SQLite Consortium Agreement</title>
</head>
<body bgcolor="white">
<h1 align="center">
SQLite Consortium Agreement
</h1>

<p>This SQLite Consortium Agreement ("Agreement") is made and
entered into as of the ____ day of _____, 2007 ("Effective Date")
by and between _____ (the "Company"), and
Hipp, Wyrick & Company, Inc., a Georgia Corporation with
headquarters at 6200 Maple Cove Lane, Charlotte, NC ("Hwaci").</p>

<p>WHEREAS, Hwaci is the developer of a serverless, embeddable, public
domain SQL database engine available at
http://www.sqlite.org/
("SQLite"); and</p>

<p>WHEREAS, Company wishes to support the independent development of
the SQLite database engine to insure the continuing reliability,
vitality, and independence of SQLite, and in connection therewith,
Company wishes to provide funds for ongoing research, development,
and maintenance of the SQLite code base, operation of the SQLite
website, protection and maintenance of the SQLite
trademark, as well as for promotion of SQLite at conferences and
trade shows; and</p>

<p>WHEREAS, Company wishes to receive benefits in the form of
```

services from Hwaci in consideration for their support of SQLite; and

WHEREAS, Company and Hwaci each wish SQLite to be supported and maintained as an independent, community-driven project, and to ensure the SQLite development team remains independent.

NOW, THEREFORE, in consideration of the mutual promises contained herein, the parties agree as follows:

## 1.0 Definitions

### 1.1 SQLite Developers

The "SQLite Developers" are the employees or contractors of Hwaci engaged in the development of SQLite, including without limitation the SQLite Architect.

### 1.2 SQLite Architect

The "SQLite Architect" is the SQLite Developer with ultimate responsibility and authority over changes and maintenance of the SQLite code. The current SQLite Architect is the original designer and developer of SQLite, D. Richard Hipp. Hwaci may change the SQLite Architect from time to time upon approval by Company.

### 1.3 Consortium Member

A "Consortium Member" is a company or organization, including but not limited to Company, which has entered into an agreement with Hwaci which is substantially similar to this Agreement.

## 2.0 Agreement

### 2.1 Responsibilities And Obligations Of SQLite Developers

#### 2.1.1 General Support

The SQLite Developers shall provide, without limit, timely and accurate answers, advice, and instruction in response to questions and comments from Company about SQLite submitted by email or by telephone at any time day or night.

#### 2.1.2 Debugging Support

The SQLite Developers shall at Company's request provide Company with direct assistance in debugging applications that are built upon or use SQLite. The combined time for Debugging Support and Custom Development for Company is limited to 330 hours per year.



#### <h4>2.1.3 Custom Development</h4>

<p>The SQLite Developers shall at the request of Company write new extensions or enhancements to SQLite according to Company's specifications. These extensions and enhancements may be proprietary to Company or open source or with the consent of both Company and the SQLite Architect may be folded into the public domain SQLite source tree. The time devoted to Custom Development for Company is limited 220 hours per year.</p></p>

#### <h4>2.1.4 Custom Builds</h4>

<p>The SQLite Developers shall at Company's request provide Company with specialized builds of SQLite according to Company's specifications.</p></p>

#### <h4>2.1.5 Legacy Support</h4>

<p>The SQLite Developers shall at Company's request provide support and bug-fix patches for any historical version of SQLite.</p></p>

#### <h4>2.1.6 Custom Testing</h4>

<p>The SQLite Developers shall at Company's request set up and run acceptance tests according Company's specifications that are specifically designed to exercise SQLite as configured and used by Company. These acceptance tests shall be run and shall pass prior to any release of SQLite.</p></p>

#### <h4>2.1.7 Priority Bug Fixes</h4>

<p>The SQLite Developers shall assign highest priority to fixing bugs in SQLite that are reported by Company or in which Company has expressed a specific interest.</p></p>

#### <h4>2.1.8 Code Quality</h4>

<p>The SQLite Developers shall at all times keep the SQLite source code well commented and documented and clearly structured and organized so that an experienced and competent programmer can understand it and support it after no more than a few months of study.</p></p>

#### <h4>2.1.9 Backwards Compatibility</h4>

<p>The SQLite Developers recognize that Company uses SQLite in mission-critical applications and therefore shall work diligently to ensure continuing bug-free correct operation and backwards compatibility with prior releases.</p></p>

#### <h4>2.1.10 Test Coverage</h4>

<p>The SQLite Developers shall maintain the SQLite test suite such that no less than 95% source code coverage is provided.

</p>

#### <h4>2.1.11 Website</h4>

<p>The SQLite Developers shall maintain the SQLite website at <a href="http://www.sqlite.org/">http://www.sqlite.org/</a> in good working order and all SQLite source code shall be made freely available at such website.

</p>

### <h3>2.2 Responsibilities And Obligations Of The SQLite Architect</h3>

#### <h4>2.2.1 Private Briefings</h4>

<p>The SQLite Architect shall, at the request of Company, provide Company with private notification and briefings of any new bugs or new features in SQLite that might effect Company's products.

</p>

#### <h4>2.2.2 Direction</h4>

<p>The SQLite Architect shall coordinate the activities of SQLite Developers and shall publish from time to time a roadmap of proposed future changes and enhancements to SQLite.

</p>

#### <h4>2.2.3 Oversight</h4>

<p>The SQLite Architect shall personally review all changes to the SQLite Source Code and take responsibility for the quality and correctness of those changes.

</p>

#### <h4>2.2.4 Continuity</h4>

<p>The initial SQLite Architect shall be the original developer of SQLite, D. Richard Hipp. The role of SQLite Architect shall not be assigned to another during the term of this Agreement except due to the disability of Dr. Hipp and with approval of Company.

</p>

### <h3>2.3 Responsibilities And Obligations Of Hwaci</h3>

#### <h4>2.3.1 Employer</h4>

<p>Hwaci shall act as the employer of the SQLite Developers and SQLite Architect and shall make all tax and legal filings and tax withholding required by employers. Hwaci shall provide

Company with W-9 information upon request.

</p>

#### <h4>2.3.2 Responsible Party</h4>

<p>All obligations of the SQLite Developers set forth in this agreement are deemed obligations of Hwaci. Hwaci shall recruit, employ, and supervise SQLite Developers in such a way that the responsibilities and obligations of the SQLite Developers set forth in this agreement are upheld.</p>

#### <h4>2.3.3 Multiple Developers</h4>

<p>Hwaci shall recruit and employ as many SQLite Developers for as many hours as can be reasonably achieved using the funds received from Consortium Members under this agreement.

So that support for SQLite will not be interrupted by the disability or withdrawal of any one SQLite Developer, Hwaci will keep at least two knowledgeable and competent SQLite Developers on staff.</p>

#### <h4>2.3.4 Mentorship</h4>

<p>Hwaci shall work to encourage independent programmers from around the world to become familiar with SQLite internals so that there will be a pool of talent able to support SQLite in the future.

</p>

#### <h4>2.3.5 Audits</h4>

<p>Hwaci shall keep and maintain complete and accurate records of the use of development funds provided by Company and shall allow Company, or its representative, a certified public accountant mutually acceptable to Hwaci and Company, during office hours and at reasonable intervals, no more than once every 12 months, to inspect and make extracts or copies of such records solely for the purpose of ascertaining Hwaci's compliance with the objectives and requirements of this agreement.

</p>

#### <h4>2.3.6 Disaster Planning</h4>

<p>Hwaci shall maintain backup copies of all SQLite source files and documentation, current and historical, at at least two separate locations separated from each other and from the primary on-line SQLite repository by at least 400 kilometers.

</p>

#### <h4>2.3.7 Trademark</h4>

<p>Hwaci shall maintain ownership of the SQLite trademark and the sqlite.org domain name and shall purchase bandwidth and

server space for the <http://www.sqlite.org/> website.

#### 2.3.8 No Take-overs or Buy-outs

Neither Hwaci nor the SQLite Architect shall relinquish development control of SQLite during the term of this Agreement, by acquisition or merger or by any other means, except with the consent of Company.

#### 2.3.9 New Consortium Members

New Consortium Members may be accepted into the consortium from time to time under identical terms as this agreement, or under substantially similar terms that have been approved by existing Consortium Members.

#### 2.3.10 Adequate Staff

Hwaci shall recruit and employ a sufficient number of qualified SQLite Developers to easily cover all custom development, debugging, and general support service obligations for all Consortium Members while still providing ample time for the SQLite Developers to engage in general maintenance and extension of SQLite.

#### 2.3.11 Use Of Funds

Hwaci shall use the funds provided hereunder solely for the development and maintenance of SQLite as set forth in this Agreement. Interest on funds received in advance and held in trust will be reinvested and used for the same purposes as the principal.

### 2.4 Responsibilities And Obligations Of Company

#### 2.4.1 Funding

Company shall provide funding for the ongoing support and maintenance of SQLite as set forth in section 3.0 "Fees".

#### 2.4.2 Copyright Disclaimer

Company acknowledges that SQLite source code and documentation published on the <http://www.sqlite.org/> SQLite website is in the public domain and that nothing in this agreement shall change that fact.

## <h2>3.0 Fees</h2>

<p>In consideration of the performance by Hwaci, the SQLite Developers, and the SQLite Architect of the obligations described herein, Company shall pay Hwaci at least US \$75,000 per year in advance either annually, quarterly, or monthly, at Company's discretion.</p>

## <h2>4.0 Confidentiality</h2>

### <h3>4.1 Definition of Confidential Information</h3>

<p>"Confidential Information" means any Company proprietary information, technical data, trade secrets or know-how, including, but not limited to, research, product plans, products, services, customers, customer lists, markets, software, developments, inventions, processes, formulas, technology, designs, drawings, engineering, hardware configuration information, marketing, finances or other business information disclosed by Company either directly or indirectly in writing, orally or by drawings or inspection of parts or equipment.</p>

### <h3>4.2 Non-Use and Non-Disclosure.</h3>

<p>Hwaci shall not, during or subsequent to the term of this Agreement, use Company's Confidential Information for any purpose whatsoever other than the performance of the Services or disclose Company's Confidential Information to any third party. The parties acknowledge that Confidential Information will remain the sole property of Company. Hwaci shall take all reasonable precautions to prevent any unauthorized disclosure of Confidential Information including, but not limited to, having each employee or consultant of Hwaci, if any, with access to any Confidential Information, execute a nondisclosure agreement containing provisions in Company's favor substantially similar to this Agreement. Confidential Information does not include information that: (i) is known to Hwaci at the time of disclosure to Hwaci by Company as evidenced by written records of Hwaci; (ii) has become publicly known and made generally available through no wrongful act of Hwaci; or (iii) has been received by Hwaci from a third party who is authorized to make such disclosure.</p>

#### <h4>4.2.1 Disclosure Required by Law</h4>

In the event any Confidential Information is required to be disclosed by Hwaci under the terms of a valid and effective subpoena or order issued by a court of competent jurisdiction, or by a demand or information request from an executive or administrative agency or other governmental authority, Hwaci shall, unless prohibited

by the terms of a subpoena, order, or demand, promptly notify Company of the existence, terms and circumstances surrounding such demand or request, shall consult with Company on the advisability of taking legally available steps to resist or narrow such demand or request, and, if disclosure of such Confidential Information is required, shall exercise its reasonable best efforts to narrow the scope of disclosure and obtain an order or other reliable assurance that confidential treatment will be accorded to such Confidential Information. To the extent that Hwaci is prohibited from notifying Company of a subpoena, order or demand, by the terms of same, Hwaci shall exercise its reasonable efforts to narrow the scope of disclosure.</p>

### <h3>4.3 Return of Materials.</h3>

<p>Upon the termination of this Agreement, or upon Company's earlier request, Hwaci shall deliver to Company all of Company's property or Confidential Information that Hwaci may have in Hwaci's possession or control.</p>

## <h2>5.0 Intellectual Property</h2>

### <h3>5.1 No Assignment</h3>

<p>Company acknowledges that all copyrightable material, notes, records, drawings, designs, inventions, improvements, developments, discoveries and trade secrets made, generated, conceived, or reduced to practice by Hwaci related to SQLite will remain the property of Hwaci. Nothing in this Agreement will be construed to transfer any intellectual property right of Hwaci to Company.</p>

### <h3>5.2 Availability and Public Domain Dedication</h3>

<p>The SQLite Developers and Hwaci shall, subject to their discretion as to the quality and suitability of the SQLite source code and documentation for public release, make the SQLite source code and documentation publicly available as downloadable files and make a public statement ceding all intellectual property rights, including but not limited to copyright and patent rights, in the SQLite source code and documentation to the public domain. To the extent that the SQLite Developers and Hwaci elect not to release the SQLite source code and documentation

publicly, they shall provide copies thereof to Company and hereby grants to Company, under all of the SQLite Developers' and Hwaci's rights including but not limited to copyright and patent rights, in and to the SQLite source code and documentation, perpetual, irrevocable, worldwide, non-exclusive, sublicenseable license to use, copy, prepare derivative works of, publicly perform and display the SQLite source code and documentation and derivative works thereof.</p>

### <h3>5.3 Trademark</h3>

<p>Hwaci shall use the name "SQLite" only to apply to the publicly available project known by such name as of the Effective Date. Hwaci may in its discretion file such trademark applications or registrations as it deems appropriate to protect or record its rights therein, and may set such policies as it deems appropriate for licensing the use of the trademark.</p>

## <h2>6.0 Representations And Warranties</h2>

### <h3>6.1 Intellectual Property Clearances.</h3>

<p>Hwaci hereby represents and warrants that Hwaci shall enter into agreements with the SQLite Developers sufficient to enable Hwaci to undertake the obligations of Section 5.</p>

### <h3>6.2 Disclaimer.</h3>

<p>THE WORK PRODUCT AND ALL MATERIAL PROVIDED BY HWACI AND COMPANY ARE PROVIDED "AS IS." NEITHER PARTY MAKES ANY REPRESENTATIONS OR WARRANTIES OF ANY KIND, WHETHER ORAL OR WRITTEN, WHETHER EXPRESS, IMPLIED, OR ARISING BY STATUTE, CUSTOM, COURSE OF DEALING OR TRADE USAGE, WITH RESPECT TO THE SUBJECT MATTER HEREOF, IN CONNECTION WITH THIS AGREEMENT. EACH PARTY SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES OR CONDITIONS OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT.</p>

## <h2>7.0 Term And Termination</h2>

### <h3>7.1 Term.</h3>

<p>This Agreement will commence on the Effective Date and will continue until 12 months after the Effective Date.

Thereafter, the parties may by mutual consent renew this Agreement subject to agreement on fees to be paid by Company for sponsorship for additional periods.</p>

### <h3>7.2 Termination.</h3>

<p>If either party materially defaults in the performance of any of its material obligations hereunder and if any such default is not corrected within 30 days after notice in writing, then the non-defaulting party, at its option, may, in addition to any other remedies it may have, thereupon terminate this Agreement by giving written notice of termination to the defaulting party.</p>

### <h3>7.3 Survival.</h3>

<p>Upon such termination all rights and duties of the parties toward each other will cease except: Sections 4 (Confidentiality), 5 (Intellectual Property), and 8 (Miscellaneous) will survive termination of this Agreement.</p>

## <h2>8. Miscellaneous</h2>

### <h3>8.1 Nonassignment/Binding Agreement.</h3>

<p>The parties acknowledge that the unique nature of Hwaci's services are substantial consideration for the parties' entering into this Agreement. Neither this Agreement nor any rights under this Agreement may be assigned or otherwise transferred by Hwaci, in whole or in part, whether voluntarily or by operation of law, without the prior written consent of Company, which consent will not be unreasonably withheld. Subject to the foregoing, this Agreement will be binding upon and will inure to the benefit of the parties and their respective successors and assigns. Any assignment in violation of the foregoing will be null and void.</p>

### <h3>8.2 Notices.</h3>

<p>Any notice required or permitted under the terms of this Agreement or required by law must be in writing and must be: (a) delivered in person; (b) sent by first class registered mail, or air mail, as appropriate; or (c) sent by overnight air courier, in each case properly posted and fully prepaid to the appropriate address set forth in the preamble to this Agreement. Either party may change its address for notice by notice to the other



party given in accordance with this Section. Notices will be considered to have been given at the time of actual delivery in person, three business days after deposit in the mail as set forth above, or one day after delivery to an overnight air courier service.</p>

### <h3>8.3 Waiver.</h3>

<p>Any waiver of the provisions of this Agreement or of a party's rights or remedies under this Agreement must be in writing to be effective. Failure, neglect, or delay by a party to enforce the provisions of this Agreement or its rights or remedies at any time, will not be construed as a waiver of such party's rights under this Agreement and will not in any way affect the validity of the whole or any part of this Agreement or prejudice such party's right to take subsequent action. No exercise or enforcement by either party of any right or remedy under this Agreement will preclude the enforcement by such party of any other right or remedy under this Agreement or that such party is entitled by law to enforce.</p>

### <h3>8.4 Severability.</h3>

<p>If any term, condition, or provision in this Agreement is found to be invalid, unlawful or unenforceable to any extent, the parties shall endeavor in good faith to agree to such amendments that will preserve, as far as possible, the intentions expressed in this Agreement. If the parties fail to agree on such an amendment, such invalid term, condition or provision will be severed from the remaining terms, conditions and provisions, which will continue to be valid and enforceable to the fullest extent permitted by law.</p>

### <h3>8.5 Integration.</h3>

<p>This Agreement contains the entire agreement of the parties with respect to the subject matter of this Agreement and supersedes all previous communications, representations, understandings and agreements, either oral or written, between the parties with respect to said subject matter. This Agreement may not be amended, except by a writing signed by both parties.</p>

### <h3>8.6 Counterparts.</h3>

<p>This Agreement may be executed in counterparts, each of which so executed will be deemed to be an original and such counterparts together will constitute one and the same agreement.</p>

### <h3>8.7 Governing Law.</h3>

<p>This Agreement will be interpreted and construed in accordance with the laws of the State of North Carolina and the United States of America, without regard to conflict of law principles. All disputes arising out of this Agreement will be subject to the exclusive jurisdiction of the state and federal courts located in North Carolina, and each party hereby consents to the personal jurisdiction thereof.</p>

### <h3>8.8 Independent Contractors.</h3>

<p>It is the intention of the parties that Hwaci is an independent contractor. Nothing in this Agreement will in any way be construed to constitute Hwaci or any of its employees as an agent, employee or representative of Company.</p>

## <h2>9.0 Signatures</h2>

<p>The parties have executed this Agreement below to indicate their acceptance of its terms.</p>

<table width="100%" border="0">

<tr><td valign="top">

HWACI<br>

By:<hr>

<p>&nbsp;</p>

Print Name:<hr>

<p>&nbsp;</p>

Title:<hr>

<p>&nbsp;</p>

</td><td width="10%"></td>

<td valign="top">

COMPANY<br>

By:<hr>

<p>&nbsp;</p>

Print Name:<hr>

<p>&nbsp;</p>

Title:<hr>

<p>&nbsp;</p>

</td></tr></table>

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/consortium\_agreement-20071201.html

No license file was found, but licenses were detected in source scan.

SQLite is high-quality, public domain software. The goal of members can also request their own private, proprietary extensions

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/consortium.html

No license file was found, but licenses were detected in source scan.

SQLite itself is in the [public domain](copyright.html) and can be used for any purpose. But TH3 is proprietary and requires a license.

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/th3.html

No license file was found, but licenses were detected in source scan.

SQLite core and like the SQLite core are in the public domain. The **TH3** test harness is a set of proprietary tests, written in C. Beginning in late 2018, SQLite has been fuzzed using a new proprietary

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/testing.html

No license file was found, but licenses were detected in source scan.

If  $N > 0$  then the connection is free to use more of the WAL file beyond

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/walformat.html

No license file was found, but licenses were detected in source scan.

application code is free to use these routines as well, if desired.

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/34to35.html

No license file was found, but licenses were detected in source scan.

**Public domain**

The source code for SQLite is in the public domain. No claim of copyright

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/different.html

No license file was found, but licenses were detected in source scan.

other proprietary or non-standard VFSes.

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/uri.html

No license file was found, but licenses were detected in source scan.

<a href="copyright.html">public domain</a>. No claim of ownership is made

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/faq.html

No license file was found, but licenses were detected in source scan.

<h2>Proprietary SQLite Extensions</h2>

<a href="copyright.html">public domain</a>. But there also exist proprietary, licensed extensions to SQLite.</p>

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/support.html

No license file was found, but licenses were detected in source scan.

application is free to use the same <a href="../c3ref/sqlite3.html">database connection</a> or the

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/c3ref/c\_config\_covering\_index\_scan.html

No license file was found, but licenses were detected in source scan.

Suppose the demo\_data.boundary field holds some proprietary data description

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/rtree.html

No license file was found, but licenses were detected in source scan.

<html>

<body bgcolor="white">

<p>FOR IMMEDIATE RELEASE:</p>

<h2 align="center">SQLite Consortium Launches With Mozilla And Symbian As Charter Members</h2>

<h3 align="center">Ensures independent technical direction for world's most deployed SQL database engine</h3>

<p><b>Charlotte, North Carolina - December 12, 2007</b> - The SQLite Consortium, a new membership association dedicated to maintaining SQLite as a fully open and independent product, was formally announced today. Mozilla and Symbian Ltd. have joined the SQLite Consortium as charter members.</p>

<p>SQLite is a compact, high efficiency, high reliability, embeddable SQL database

engine. The source code to SQLite is in the public domain and is available with no associated fees. SQLite is the most deployed SQL database engine in the world and is currently used in a wide range of commercial software products and electronic devices from leading manufacturers. SQLite is found today in many mobile phones, MP3 players, set-top boxes, and PCs.</p>

<p>The mission of the SQLite Consortium is to continue developing and enhancing SQLite as a product that anyone may use without paying royalties or licensing fees. Members of the SQLite Consortium provide funding to enable this mission and in return receive enterprise-level technical support. Technical control and direction of SQLite remains entirely with the SQLite developers.</p>

<p>Mozilla, developer of the popular open-source Firefox web browser, and Symbian, the market-leading open operating system for advanced data-enabled smartphones, both deploy the SQLite database engine in their products. As charter members of the Consortium, Mozilla and Symbian are ensuring the development and support of SQLite as a freely accessible and public domain software asset.</p>

<p>"SQLite has become a popular embedded database because it is lightweight, fast, and open source," said Michael Schroepfer, Vice President of Engineering, Mozilla. "As a charter member of the SQLite Consortium, Mozilla is excited to help ensure SQLite remains a vibrant and open technology, in line with our mission to promote choice and innovation on the Internet."</p>

<p>"The SQLite Consortium will help set the standards for database management which are essential in smartphone functionality and will also help create a pool of developers, highly-skilled in SQLite for future mobile phone development, " said Bruce Carney, Director, Developer Programmes & Services, Symbian. "Our involvement with the SQL Consortium not only demonstrates Symbian's commitment to open standards in the industry, but as mobile phones become increasingly powerful and smartphones become increasingly popular, we are focused on ensuring that desktop developers, who move to the mobile space, have the easiest and most productive experience possible."</p>

<p>SQLite is a winner of the 2005 Google/O'Reilly Open Source Award. Additional information regarding the SQLite Consortium is available at the SQLite website, <http://www.sqlite.org/>.</p>

<center>  
###  
</center>

<p><b>About SQLite</b></p>

<p>SQLite is a software library that implements a self-contained, embeddable, serverless, zero-configuration, transactional SQL database engine. The code for SQLite is in the public domain and is free for any use, commercial or private. SQLite is currently found in countless software titles and electronic devices.</p>

<p>SQLite was originally developed and released 2000 by Dr. D. Richard Hipp. The code continues to be maintained and enhanced by an international team of developers under Hipp's direction.</p>

<p>  
CONTACT INFORMATION:<br>  
SQLite Consortium<br>  
Dr. D. Richard Hipp<br>  
6200 Maple Cove Lane<br>  
Charlotte, NC 28269<br>  
Email: drh@sqlite.org<br>  
<http://www.sqlite.org/><br>  
Tel: +1.704.948.4565  
</p>

<p><b>About Mozilla</b></p>

<p>Mozilla is a global community dedicated to building free, open source products and technologies that improve the online experience for people everywhere. Mozilla works in the open with a highly disciplined, transparent and cooperative development process, under the umbrella of the non-profit Mozilla Foundation. As a wholly owned subsidiary, the Mozilla Corporation organizes the development and marketing of Mozilla products. This unique structure has enabled Mozilla to financially support and cultivate competitive, viable community innovation. For more information, visit [www.mozilla.com](http://www.mozilla.com).</p>

<p>CONTACT INFORMATION:<br>  
Mozilla Corporation<br>  
Jessica Waight<br>  
Tel: +1.415.345.4754<br>  
Email: [jwaight@outcastpr.com](mailto:jwaight@outcastpr.com)  
</p>

<p><b>About Symbian Limited</b></p>

<p>Symbian is a software licensing company that develops and licenses Symbian OS, the market-leading open operating system for advanced, data-enabled mobile phones known as smartphones.</p>

<p>Symbian licenses Symbian OS to the world's leading handset manufacturers and has built close co-operative business relationships with leading companies across the mobile industry. During Q3 2007, 20.4 million Symbian smartphones were sold worldwide to over 250 major network operators, bringing the total number of Symbian smartphones shipped up to 30 September 2007 to 165 million.</p>

<p>Symbian has its headquarters in London, United Kingdom, with offices in the United States, United Kingdom, Asia (India, P.R. China, and Korea) and Japan. For more information, please visit [www.symbian.com](http://www.symbian.com).</p>

<p>CONTACT INFORMATION:<br>

Symbian Global Press Office<br>

Karen Hamblen<br>

+44 207 154 1707<br>

[press@symbian.com](mailto:press@symbian.com)

</p>

</body></html>

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/pressrelease-20071212.html

No license file was found, but licenses were detected in source scan.

access to all proprietary extensions and test suites.

access to all proprietary extensions and test suites.

<a href="https://www.sqlite.org/copyright.html">public domain</a>,</p>

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/prosupport.html

No license file was found, but licenses were detected in source scan.

<li> <a href='copyright.html'>Public domain source code</a>

<a href="copyright.html">public domain</a> and is thus free for

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/about.html

No license file was found, but licenses were detected in source scan.

```
#!/usr/bin/tclsh.docsrc
```

```
Import of wapp.tcl
```

```
Copyright (c) 2017 D. Richard Hipp
```

```
#
```

```
This program is free software; you can redistribute it and/or
modify it under the terms of the Simplified BSD License (also
known as the "2-Clause License" or "FreeBSD License".)
```

```
#
```

```
This program is distributed in the hope that it will be useful,
but without any warranty; without even the implied warranty of
merchantability or fitness for a particular purpose.
```

```
#
```

```
#-----
```

```
#
```

```
Design rules:
```

```
#
```

```

(1) All identifiers in the global namespace begin with "wapp"
#
(2) Identifiers intended for internal use only begin with "wappInt"
#

Add text to the end of the HTTP reply. No interpretation or transformation
of the text is performed. The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

Add text to the page under construction. Do no escaping on the text.
#
Though "unsafe" in general, there are uses for this kind of thing.
For example, if you want to return the complete, unmodified content of
a file:
#
set fd [open content.html rb]
wapp-unsafe [read $fd]
close $fd
#
You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
The difference is that wapp-safety-check will complain about the misuse
of "wapp", but it assumes that the person who writes "wapp-unsafe" understands
the risks.
#
Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
 global wapp
 dict append wapp .reply $txt
}

Add text to the end of the reply under construction. The following
substitutions are made:
#
%html(...) Escape text for inclusion in HTML
%url(...) Escape text for use as a URL
%qp(...) Escape text for use as a URI query parameter
%string(...) Escape text for use within a JSON string
%unsafe(...) No transformations of the text
#
The substitutions above terminate at the first ")" character. If the
text of the TCL string in ... contains ")" characters itself, use instead:
#
%html%(...)%

```



```

%url%(...)%
%qp%(...)%
%string%(...)%
%unsafe%(...)%
#
In other words, use "%(...)" instead of "(...)" to include the TCL string
to substitute.
#
The %unsafe substitution should be avoided whenever possible, obviously.
In addition to the substitutions above, the text also does backslash
escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {% (html|url|qp|string|unsafe){ 1,1}?(|%)\((.+)\)\2} $txt \
 {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

Works like wapp-subst, but also removes whitespace from the beginning
of lines.
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string trim $txt] \n txt
 regsub -all {% (html|url|qp|string|unsafe){ 1,1}?(|%)\((.+)\)\2} $txt \
 {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

There must be a wappInt-enc-NAME routine for each possible substitution
in wapp-subst. Thus there are routines for "html", "url", "qp", and "unsafe".
#
wappInt-enc-html Escape text so that it is safe to use in the
body of an HTML document.
#
wappInt-enc-url Escape text so that it is safe to pass as an
argument to href= and src= attributes in HTML.
#
wappInt-enc-qp Escape text so that it is safe to use as the
value of a query parameter in a URL or in
post data or in a cookie.
#
wappInt-enc-string Escape ", ', \, and < for using inside of a
javascript string literal. The < character
is escaped to prevent "</script>" from causing
problems in embedded javascript.
#

```



```

 $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
regsub -all -- \
 {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
 $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\u00\1} str
return [subst -novar $str]
}

```

# Reset the document back to an empty string.

```

#
proc wapp-reset {} {
 global wapp
 dict set wapp .reply {}
}

```

# Change the mime-type of the result document.

```

#
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

```

# Change the reply code.

```

#
proc wapp-reply-code {x} {
 global wapp
 dict set wapp .reply-code $x
}

```

# Set a cookie

```

#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

```

# Unset a cookie

```

#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

```

# Add extra entries to the reply header

```

#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

```

```

Specifies how the web-page under construction should be cached.
The argument should be one of:
#
no-cache
max-age=N (for some integer number of seconds, N)
private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

Redirect to a different web page
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra Location $uri
}

Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
}

Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

Return all parameter names that match the GLOB pattern, or all
names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}}} {
 global wapp
 return [dict keys $wapp $glob]
}

```

```

By default, Wapp does not decode query parameters and POST parameters
for cross-origin requests. This is a security restriction, designed to
help prevent cross-site request forgery (CSRF) attacks.
#
As a consequence of this restriction, URLs for sites generated by Wapp
that contain query parameters will not work as URLs found in other
websites. You cannot create a link from a second website into a Wapp
website if the link contains query planner, by default.
#
Of course, it is sometimes desirable to allow query parameters on external
links. For URLs for which this is safe, the application should invoke
wapp-allow-xorigin-params. This procedure tells Wapp that it is safe to
go ahead and decode the query parameters even for cross-site requests.
#
In other words, for Wapp security is the default setting. Individual pages
need to actively disable the cross-site request security if those pages
are safe for cross-site access.
#
proc wapp-allow-xorigin-params {} {
 global wapp
 if {[dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
 wappInt-decode-query-params
 }
}

Set the content-security-policy.
#
The default content-security-policy is very strict: "default-src 'self'"
The default policy prohibits the use of in-line javascript or CSS.
#
Provide an alternative CSP as the argument. Or use "off" to disable
the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
 dict unset wapp .csp
 } else {
 dict set wapp .csp $val
 }
}

Examine the bodys of all procedures in this program looking for
unsafe calls to various Wapp interfaces. Return a text string
containing warnings. Return an empty string if all is ok.
#
This routine is advisory only. It misses some constructs that are

```

```

dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
 set ln 0
 foreach x [split [info body $p] \n] {
 incr ln
 if {[regexp {^[\t]*wapp[\t]+([\n]+)} $x all tail]
 && [string index $tail 0]!="\173"
 && [regexp {[[\]]} $tail]
 } {
 append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
 }
 if {[regexp {^[\t]*wapp-(subst(trim)[\t]+[^\173]) $x all cx]} {
 append res "$p:$ln: unsafe \"wapp-$cx\" call: \"[string trim $x]\"\n"
 }
 }
 }
 return $res
}

Return a string that describes the current environment. Applications
might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
 if {[string index $var 0]=="."} continue
 append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

Tracing function for each HTTP request. This is overridden by wapp-start
if tracing is enabled.
#
proc wappInt-trace {} {}

Start up a listening socket. Arrange to invoke wappInt-new-connection
for each inbound HTTP connection.
#
port Listen on this TCP port. 0 means to select a port
that is not currently in use
#
wappmode One of "scgi", "server", or "local".

```

```

#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
 set type SCGI
 set server [list wappInt-new-connection wappInt-scgi-readable $wappmode]
 } else {
 set type HTTP
 set server [list wappInt-new-connection wappInt-http-readable $wappmode]
 }
 if {$wappmode=="local"} {
 set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
 set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
 wappInt-start-browser http://127.0.0.1:$port/
 } else {
 puts "Listening for $type requests on TCP port $port"
 }
}

Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
 exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
 exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
 exec firefox $url &
 }
}

This routine is a "socket -server" callback. The $chan, $ip, and $port
arguments are added by the socket command.
#
Arrange to invoke $callback when content is available on the new socket.
The $callback will process inbound HTTP or SCGI content.
#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
 .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

```

```

}

Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
 # This happens after completing a CGI request
 exit 0
 } else {
 unset ::wappInt-$chan
 close $chan
 }
}

Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
 puts stderr "$msg\n$::errorInfo"
 wappInt-close-channel $chan
 }
}

proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {[dict exists $W .toread]} {
 # If the .toread key is not set, that means we are still reading
 # the header
 set line [string trimright [gets $chan]]
 set n [string length $line]
 if {$n>0} {
 if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
 dict append W .header $line
 } else {
 dict append W .header \n$line
 }
 }
 if {[string length [dict get $W .header]]>100000} {
 error "HTTP request header too big - possible DOS attack"
 }
 } elseif {$n==0} {
 # We have reached the blank line that terminates the header.
 global argv0
 set a0 [file normalize $argv0]
 dict set W SCRIPT_FILENAME $a0
 dict set W DOCUMENT_ROOT [file dir $a0]
 if {[wappInt-parse-header $chan]} {
 catch {close $chan}
 return
 }
 }
}

```



```

set len 0
if {[dict exists $W CONTENT_LENGTH]} {
 set len [dict get $W CONTENT_LENGTH]
}
if {$len>0} {
 # Still need to read the query content
 dict set W .toread $len
} else {
 # There is no query content, so handle the request immediately
 set wapp $W
 wappInt-handle-request $chan 0
}
} else {
 # If .toread is set, that means we are reading the query content.
 # Continue reading until .toread reaches zero.
 set got [read $chan [dict get $W .toread]]
 dict append W CONTENT $got
 dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
 if {[dict get $W .toread]<=0} {
 # Handle the request as soon as all the query content is received
 set wapp $W
 wappInt-handle-request $chan 0
 }
}
}

Decode the HTTP request header.
#
This routine is always running inside of a [catch], so if
any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
 error "unsupported request method: \"[dict get $W REQUEST_METHOD]\""
 }
 set uri [lindex $req 1]
 set split_uri [split $uri ?]
 set uri0 [lindex $split_uri 0]
 if {![regexp {-a-z0-9_/*} $uri0]} {
 error "invalid request uri: \"$uri0\""
 }
 dict set W REQUEST_URI $uri0
}

```

```

dict set W PATH_INFO $uri0
set uri1 [lindex $split_uri 1]
dict set W QUERY_STRING $uri1
set n [llength $hdr]
for {set i 1} {$i<$n} {incr i} {
 set x [lindex $hdr $i]
 if {[regexp {^(.+):+(.*)$} $x all name value]} {
 error "invalid header line: \"$x\""
 }
 set name [string toupper $name]
 switch -- $name {
 REFERER {set name HTTP_REFERER}
 USER-AGENT {set name HTTP_USER_AGENT}
 CONTENT-LENGTH {set name CONTENT_LENGTH}
 CONTENT-TYPE {set name CONTENT_TYPE}
 HOST {set name HTTP_HOST}
 COOKIE {set name HTTP_COOKIE}
 ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
 default {set name .hdr:$name}
 }
 dict set W $name $value
}
return 0
}

Decode the QUERY_STRING parameters from a GET request or the
application/x-www-form-urlencoded CONTENT from a POST request.
#
This routine sets the ".qp" element of the ::wapp dict as a signal
that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
 foreach qterm [split [dict get $wapp QUERY_STRING] &] {
 set qsplit [split $qterm =]
 set nm [lindex $qsplit 0]
 if {[regexp {[a-z][a-z0-9]*$} $nm]} {
 dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
 }
 }
 }
}

if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
 set ctype [dict get $wapp CONTENT_TYPE]
 if {$ctype=="application/x-www-form-urlencoded"} {
 foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
 set qsplit [split $qterm =]

```



```

if {[dict exists $wapp REQUEST_URI]} {
 dict set wapp REQUEST_URI /
} elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
 # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
 # These need to be stripped off
 dict set wapp REQUEST_URI $newR
}
if {[dict exists $wapp SCRIPT_NAME]} {
 dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
} else {
 dict set wapp SCRIPT_NAME {}
}
if {[dict exists $wapp PATH_INFO]} {
 # If PATH_INFO is missing (ex: nginx) the construct it
 set URI [dict get $wapp REQUEST_URI]
 set skip [string length [dict get $wapp SCRIPT_NAME]]
 dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^/([/\+)(.*)$} [dict get $wapp PATH_INFO] all head tail]} {
 dict set wapp PATH_HEAD $head
 dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
 dict set wapp PATH_INFO {}
 dict set wapp PATH_HEAD {}
 dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

Parse query parameters from the query string, the cookies, and
POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
 foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
 set qspl [split [string trim $qterm] =]
 set nm [lindex $qspl 0]
 if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
 dict set wapp $nm [wappInt-decode-url [lindex $qspl 1]]
 }
 }
}
set same_origin 0
if {[dict exists $wapp HTTP_REFERER]} {
 set referer [dict get $wapp HTTP_REFERER]
 set base [dict get $wapp BASE_URL]
 if {$referer==$base || [string match $base/* $referer]} {
 set same_origin 1
 }
}
}

```

```

dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
 wappInt-decode-query-params
}

Invoke the application-defined handler procedure for this page
request. If an error occurs while running that procedure, generate
an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
 if {$mname!="" && [llength [info proc wapp-page-$mname]]>0} {
 wapp-page-$mname
 } else {
 wapp-default
 }
} msg]} {
 if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
 puts "ERROR: $::errorInfo"
 }
 wapp-reset
 wapp-reply-code "500 Internal Server Error"
 wapp-mimetype text/html
 wapp-trim {
 <h1>Wapp Application Error</h1>
 <pre>%html($::errorInfo)</pre>
 }
 dict unset wapp .new-cookies
}

Transmit the HTTP reply
#
if {$chan=="stdout"} {
 puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
 puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
 puts $chan "Server: wapp\r"
 puts $chan "Connection: close\r"
}
if {[dict exists $wapp .reply-extra]} {
 foreach {name value} [dict get $wapp .reply-extra] {
 puts $chan "$name: $value\r"
 }
}
if {[dict exists $wapp .csp]} {
 puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
}

```

```

}
set mimetype [dict get $wapp .mimetype]
puts $chan "Content-Type: $mimetype\r"
if [[dict exists $wapp .new-cookies]] {
 foreach {nm val} [dict get $wapp .new-cookies] {
 if {[regexp {[a-z][-a-z0-9_]*$} $nm]} {
 if {$val==""} {
 puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
 } else {
 set val [wappInt-enc-url $val]
 puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=\r"
 }
 }
 }
}
}
}
if [[string match text/* $mimetype]] {
 set reply [encoding convertto utf-8 [dict get $wapp .reply]]
 if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
 catch {
 set x [zlib gzip $reply]
 set reply $x
 puts $chan "Content-Encoding: gzip\r"
 }
 }
} else {
 set reply [dict get $wapp .reply]
}
puts $chan "Content-Length: [string length $reply]\r"
puts $chan \r
puts $chan $reply
flush $chan
wappInt-close-channel $chan
}

```

```

This routine runs just prior to request-handler dispatch. The
default implementation is a no-op, but applications can override
to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

```

```

Process a single CGI request
#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
 CONTENT_LENGTH
 CONTENT_TYPE
 DOCUMENT_ROOT

```

```

HTTP_ACCEPT_ENCODING
HTTP_COOKIE
HTTP_HOST
HTTP_REFERER
HTTP_USER_AGENT
HTTPS
PATH_INFO
QUERY_STRING
REMOTE_ADDR
REQUEST_METHOD
REQUEST_URI
REMOTE_USER
SCRIPT_FILENAME
SCRIPT_NAME
SERVER_NAME
SERVER_PORT
SERVER_PROTOCOL
} {
 if {[info exists env($key)]} {
 dict set wapp $key $env($key)
 }
}
set len 0
if {[dict exists $wapp CONTENT_LENGTH]} {
 set len [dict get $wapp CONTENT_LENGTH]
}
if {$len>0} {
 fconfigure stdin -translation binary
 dict set wapp CONTENT [read stdin $len]
}
dict set wapp WAPP_MODE cgi
fconfigure stdout -translation binary
wappInt-handle-request stdout 1
}

Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
 puts stderr "$msg\n$::errorInfo"
 wappInt-close-channel $chan
 }
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {[dict exists $W .toread]} {
 # If the .toread key is not set, that means we are still reading
 # the header.

```

```

#
An SGI header is short. This implementation assumes the entire
header is available all at once.
#
set req [read $chan 15]
set n [string length $req]
scan $req %d:%s len hdr
incr len [string length "$len:,"]
append hdr [read $chan [expr {$len-15}]]
foreach {nm val} [split $hdr \000] {
 if {$nm==","} break
 dict set W $nm $val
}
set len 0
if {[dict exists $W CONTENT_LENGTH]} {
 set len [dict get $W CONTENT_LENGTH]
}
if {$len>0} {
 # Still need to read the query content
 dict set W .toread $len
} else {
 # There is no query content, so handle the request immediately
 set wapp $W
 wappInt-handle-request $chan 0
}
} else {
 # If .toread is set, that means we are reading the query content.
 # Continue reading until .toread reaches zero.
 set got [read $chan [dict get $W .toread]]
 dict append W CONTENT $got
 dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
 if {[dict get $W .toread]<=0} {
 # Handle the request as soon as all the query content is received
 set wapp $W
 wappInt-handle-request $chan 0
 }
}
}

Start up the wapp framework. Parameters are a list passed as the
single argument.
#
-server $PORT Listen for HTTP requests on this TCP port $PORT
#
-local $PORT Listen for HTTP requests on 127.0.0.1:$PORT
#
-scgi $PORT Listen for SCGI requests on TCP port $PORT
#

```



```

-cgi Handle a single CGI request
#
With no arguments, the behavior is called "auto". In "auto" mode,
if the GATEWAY_INTERFACE environment variable indicates CGI, then run
as CGI. Otherwise, start an HTTP server bound to the loopback address
only, on an arbitrary TCP port, and automatically launch a web browser
on that TCP port.
#
Additional options:
#
-trace "puts" each request URL as it is handled, for
debugging
#
-lint Run wapp-safety-check on the application instead
of running the application itself
#
-Dvar=value Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
 set term [lindex $arglist $i]
 if {[string match --* $term]} {set term [string range $term 1 end]}
 switch -glob -- $term {
 -server {
 incr i;
 set mode "server"
 set port [lindex $arglist $i]
 }
 -local {
 incr i;
 set mode "local"
 set port [lindex $arglist $i]
 }
 -scgi {
 incr i;
 set mode "scgi"
 set port [lindex $arglist $i]
 }
 -cgi {
 set mode "cgi"
 }
 -trace {
 proc wappInt-trace {} {

```

```

set q [wapp-param QUERY_STRING]
set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
if {$q!=""} {append uri ?$q}
puts $uri
}
}
-lint {
set res [wapp-safety-check]
if {$res!=""} {
puts "Potential problems in this code:"
puts $res
exit 1
} else {
exit
}
}
-D*=* {
if {[regexp {^D([^\=]+)=(.*)$} $term all var val]} {
set ::$var $val
}
}
default {
error "unknown option: $term"
}
}
}
if {($mode=="auto"
&& [info exists env(GATEWAY_INTERFACE)]
&& [string match CGI/1.* $env(GATEWAY_INTERFACE)])
|| $mode=="cgi"
} {
wappInt-handle-cgi-request
return
}
if {$mode=="scgi"} {
wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
wappInt-start-listener $port server
} else {
wappInt-start-listener $port local
}
vwait ::forever
}

Call this version 1.0
package provide wapp 1.0

End of wapp.tcl

```

```

Generate all header content for the output document
#
proc search_header { } {
 wapp-trim {
 <!DOCTYPE html>
 <html><head>
 <meta name="viewport" content="width=device-width, initial-scale=1.0">
 <meta http-equiv="content-type" content="text/html; charset=UTF-8">
 <link href="../sqlite.css" rel="stylesheet">
 <title>Search SQLite Stats</title>
 <!-- path=../ -->
 </head>
 <body>
 <div class=nosearch>

 <div><!-- IE hack to prevent disappearing logo --></div>
 <div class="tagline desktoponly">
 Small. Fast. Reliable.
Choose any three.
 </div>
 <div class="menu mainmenu">

 Home
 <li class='mobileonly'>Menu
 <li class='wideonly'>About
 <li class='desktoponly'>Documentation
 <li class='desktoponly'>Download
 <li class='wideonly'>License
 <li class='desktoponly'>Support
 <li class='desktoponly'>Purchase
 <li class='search' id='search_menubutton'>
 Search

 </div>
 <div class="menu submenu" id="submenu">

 About
 Documentation
 Download
 Support
 Purchase

 </div>
 <div class="searchmenu" id="searchmenu">
 <form method="GET" action="../search">
 <select name="s" id="searchtype">

```

```

<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
</form>
</div>
</div>
<script>
function toggle_div(nm) {
var w = document.getElementById(nm);
if(w.style.display=="block"){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if(w.style.display=="block"){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){ document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){ div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if(!location.origin.match || !location.origin.match(/http/)){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
var b = document.getElementById(btn);
if(x.style.display!='none'){
x.style.display = 'none';
b.innerHTML='show';
}else{
x.style.display = "";
b.innerHTML='hide';
}
}
return false;
}

```

```
</script>
</div>
}
}
```

```
proc wapp-default {} {
When running using the built-in webserver in Wapp (in other words,
when not running as CGI) any filename that contains a "." loads
directly from the filesystem.
if {[wapp-param WAPP_MODE]!="cgi"}
&& [string match *.* [wapp-param PATH_INFO]]
} {
set altfile [file dir [wapp-param SCRIPT_FILENAME]]/./[wapp-param PATH_INFO]
set fd [open $altfile rb]
fconfigure $fd -translation binary
wapp-unsafe [read $fd]
close $fd
switch -glob -- $altfile {
*.html {
wapp-mimetype text/html
}
*.css {
wapp-mimetype text/css
}
*.gif {
wapp-mimetype image/gif
}
}
return
}
wapp-page-admin
}
proc wapp-page-admin {} {
wapp-allow-xorigin-params
wapp-content-security-policy off
if {[wapp-param-exists env]} {
search_header
wapp-trim {
<h1>Environment</h1>
<pre>%html([wapp-debug-env])</pre>
}
return
}
sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/searchlog.db
set where ""
set res ""

set ipfilter ""
```

```

set ipaddr [wapp-param ip]
if {$ipaddr!=""} {
 set where {WHERE ip = $ipaddr}
 set ipfilter $ipaddr
}

set checked ""
set isUnique [expr {[wapp-param unique 0]+0}]
if {$isUnique} {
 set checked "checked"
}

set limit [wapp-param limit 10]
set s10 ""
set s100 ""
set s1000 ""
if {$limit==10} {set s10 selected}
if {$limit==100} {set s100 selected}
if {$limit==1000} {set s1000 selected}

search_header
set self [wapp-param PATH_HEAD]
wapp-trim {
 <div style="margin:2em">
 <center>
 <form action=%url($self) method='GET'>
 Results: <select name=limit onChange="this.form.submit()">
 <option %html($s10) value="10">10</option>
 <option %html($s100) value="100">100</option>
 <option %html($s1000) value="1000">1000</option>
 </select>
 IP: <input type=input name=ip value="%html($ipfilter)">
 Unique: <input
 type=checkbox name=unique value=1
 $checked
 onChange="this.form.submit()">
 <input type=submit>
 </form>
 </center>
 </div>
 <table border=1 cellpadding=10 align=center>
 <tr><td><th>IP <th>Query <th> Results <th> Timestamp
}

set i 0
db2 eval "
SELECT rowid, ip, query, nres, timestamp FROM log $where
ORDER BY rowid DESC

```

```

" {

if {$isUnique} {
 if {[info exists seen($query)]} continue
 set seen($query) 1
}

wapp-trim {
 <tr><td>%html($rowid)
 <td>%html($ip)
 <td>%html($query)
 <td>%html($nres)<td>%html($timestamp)
 }
 incr i
 if {$i >= $limit} break
}
wapp-subst {</table\n}
db2 close
}
wapp-start $argv

```

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/search.d/admin  
 No license file was found, but licenses were detected in source scan.

SQLite is in the public domain. This document describes what that means

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/docs.html  
 No license file was found, but licenses were detected in source scan.

without a shared lock, other processes are free to modify the database

Found in path(s):

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public domain.

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/changes.html

No license file was found, but licenses were detected in source scan.

<html>

<title>SQLite Copyright Release Template</title>

<body bgcolor="white">

<h1 align="center">

Copyright Release for<br>

Contributions To SQLite

</h1>

<p>

SQLite is software that implements an embeddable SQL database engine.

SQLite is available for free download from <http://www.sqlite.org/>.

The principal author and maintainer of SQLite has disclaimed all copyright interest in his contributions to SQLite and thus released his contributions into the public domain.

In order to keep the SQLite software unencumbered by copyright claims, the principal author asks others who may from time to time contribute changes and enhancements to likewise disclaim their own individual copyright interest.

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<p>

For the purposes of this document, "SQLite software" shall mean any computer source code, documentation, makefiles, test scripts, or other information that is published on the SQLite website, <http://www.sqlite.org/>. Precompiled binaries are excluded from the definition of "SQLite software" in this document because the process of compiling the software may introduce information from outside sources which is not properly a part of SQLite.

</p>

<p>

The header comments on the SQLite source files exhort the reader to share freely and to never take more than one gives.

In the spirit of that exhortation I make the following declarations:

</p>

<ol>

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I dedicate to the public domain any and all copyright interest in the SQLite software that was publicly available on the SQLite website (<http://www.sqlite.org/>) prior to the date of the signature below and any changes or enhancements to the SQLite software that I may cause to be published on that website in the future. I make this dedication for the benefit of the public at large and to the detriment of my heirs and successors. I intend this dedication to be an overt act of relinquishment in perpetuity of all present and future rights to the SQLite software under copyright law.

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<li><p>

To the best of my knowledge and belief, the changes and enhancements that I have contributed to SQLite are either originally written by me or are derived from prior works which I have verified are also in the public domain and are not subject to claims of copyright by other parties.

</p></li>

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To the best of my knowledge and belief, no individual, business, organization, government, or other entity has any copyright interest

in the SQLite software as it existed on the  
SQLite website as of the date on the signature line below.

</p></li>

<li><p>

I agree never to publish any additional information  
to the SQLite website (by CVS, email, scp, FTP, or any other means) unless  
that information is an original work of authorship by me or is derived from  
prior published versions of SQLite.

I agree never to copy and paste code into the SQLite code base from  
other sources.

I agree never to publish on the SQLite website any information that  
would violate a law or breach a contract.

</p></li>

</ol>

<p>

<table width="100%" cellpadding="0" cellspacing="0">

<tr>

<td width="60%" valign="top">

Signature:

<p>&nbsp;</p>

<p>&nbsp;</p>

<p>&nbsp;</p>

</td><td valign="top" align="left">

Date:

</td></tr>

<td colspan=2>

Name (printed):

</td>

</tr>

</table>

</body>

</html>

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/copyright-release.html

No license file was found, but licenses were detected in source scan.

#!/usr/bin/tclsh.docsrc

#### Import of wapp.tcl

# Copyright (c) 2017 D. Richard Hipp

#

# This program is free software; you can redistribute it and/or

# modify it under the terms of the Simplified BSD License (also

# known as the "2-Clause License" or "FreeBSD License".)

#

# This program is distributed in the hope that it will be useful,

```

but without any warranty; without even the implied warranty of
merchantability or fitness for a particular purpose.
#
#-----
#
Design rules:
#
(1) All identifiers in the global namespace begin with "wapp"
#
(2) Identifiers intended for internal use only begin with "wappInt"
#

Add text to the end of the HTTP reply. No interpretation or transformation
of the text is performed. The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

Add text to the page under construction. Do no escaping on the text.
#
Though "unsafe" in general, there are uses for this kind of thing.
For example, if you want to return the complete, unmodified content of
a file:
#
set fd [open content.html rb]
wapp-unsafe [read $fd]
close $fd
#
You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
The difference is that wapp-safety-check will complain about the misuse
of "wapp", but it assumes that the person who write "wapp-unsafe" understands
the risks.
#
Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
 global wapp
 dict append wapp .reply $txt
}

Add text to the end of the reply under construction. The following
substitutions are made:
#
%html(...) Escape text for inclusion in HTML
%url(...) Escape text for use as a URL
%qp(...) Escape text for use as a URI query parameter

```

```

%string(...) Escape text for use within a JSON string
%unsafe(...) No transformations of the text
#
The substitutions above terminate at the first ")" character. If the
text of the TCL string in ... contains ")" characters itself, use instead:
#
%html%(...)%)
%url%(...)%)
%qp%(...)%)
%string%(...)%)
%unsafe%(...)%)
#
In other words, use "%(...)%" instead of "(...)" to include the TCL string
to substitute.
#
The %unsafe substitution should be avoided whenever possible, obviously.
In addition to the substitutions above, the text also does backslash
escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {% (html|url|qp|string|unsafe){1,1}?(|%)((.+))\2} $txt \
 {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

Works like wapp-subst, but also removes whitespace from the beginning
of lines.
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string trim $txt] \n txt
 regsub -all {% (html|url|qp|string|unsafe){1,1}?(|%)((.+))\2} $txt \
 {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

There must be a wappInt-enc-NAME routine for each possible substitution
in wapp-subst. Thus there are routines for "html", "url", "qp", and "unsafe".
#
wappInt-enc-html Escape text so that it is safe to use in the
body of an HTML document.
#
wappInt-enc-url Escape text so that it is safe to pass as an
argument to href= and src= attributes in HTML.
#
wappInt-enc-qp Escape text so that it is safe to use as the
value of a query parameter in a URL or in

```

```

post data or in a cookie.
#
wappInt-enc-string Escape ", ', \, and < for using inside of a
javascript string literal. The < character
is escaped to prevent "</script>" from causing
problems in embedded javascript.
#
wappInt-enc-unsafe Perform no encoding at all. Unsafe.
#
proc wappInt-enc-html {txt} {
 return [string map {& < > \" \\ \} $txt]
}
proc wappInt-enc-unsafe {txt} {
 return $txt
}
proc wappInt-enc-url {s} {
 if {[regsub -all {[^~?=#_./a-zA-Z0-9]} $s {[wappInt-%HHchar {&}] s}} {
 set s [subst -novar -noback $s]
 }
 if {[regsub -all [{}]} $s {[wappInt-%HHchar \\&]} s]} {
 set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-qp {s} {
 if {[regsub -all {[^~?=#_./a-zA-Z0-9]} $s {[wappInt-%HHchar {&}] s}} {
 set s [subst -novar -noback $s]
 }
 if {[regsub -all [{}]} $s {[wappInt-%HHchar \\&]} s]} {
 set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-string {s} {
 return [string map {\\ \\\\ \" \"\" ' \\' < \\u003c} $s]
}

This is a helper routine for wappInt-enc-url and wappInt-enc-qp. It returns
an appropriate %HH encoding for the single character c. If c is a unicode
character, then this routine might return multiple bytes: %HH%HH%HH
#
proc wappInt-%HHchar {c} {
 if {$c==" "} {return +}
 return [regsub -all .. [binary encode hex [encoding convertto utf-8 $c]] {%&}]
}

Undo the www-url-encoded format.

```

```

#
HT: This code stolen from ncgi.tcl
#
proc wappInt-decode-url {str} {
 set str [string map [list + { } "\" "\\\\" \[\\\[\] \\\]] $str]
 regsub -all -- \
 {%([Ee][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
 $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
 regsub -all -- \
 {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
 $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
 regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\u00\1} str
 return [subst -novar $str]
}

Reset the document back to an empty string.
#
proc wapp-reset {} {
 global wapp
 dict set wapp .reply {}
}

Change the mime-type of the result document.
#
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

Change the reply code.
#
proc wapp-reply-code {x} {
 global wapp
 dict set wapp .reply-code $x
}

Set a cookie
#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

Unset a cookie
#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

```

```

Add extra entries to the reply header
#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

Specifies how the web-page under construction should be cached.
The argument should be one of:
#
no-cache
max-age=N (for some integer number of seconds, N)
private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

Redirect to a different web page
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra Location $uri
}

Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
}

Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

```

```

Return all parameter names that match the GLOB pattern, or all
names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}} } {
 global wapp
 return [dict keys $wapp $glob]
}

By default, Wapp does not decode query parameters and POST parameters
for cross-origin requests. This is a security restriction, designed to
help prevent cross-site request forgery (CSRF) attacks.
#
As a consequence of this restriction, URLs for sites generated by Wapp
that contain query parameters will not work as URLs found in other
websites. You cannot create a link from a second website into a Wapp
website if the link contains query planner, by default.
#
Of course, it is sometimes desirable to allow query parameters on external
links. For URLs for which this is safe, the application should invoke
wapp-allow-xorigin-params. This procedure tells Wapp that it is safe to
go ahead and decode the query parameters even for cross-site requests.
#
In other words, for Wapp security is the default setting. Individual pages
need to actively disable the cross-site request security if those pages
are safe for cross-site access.
#
proc wapp-allow-xorigin-params { } {
 global wapp
 if {![dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
 wappInt-decode-query-params
 }
}

Set the content-security-policy.
#
The default content-security-policy is very strict: "default-src 'self'"
The default policy prohibits the use of in-line javascript or CSS.
#
Provide an alternative CSP as the argument. Or use "off" to disable
the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
 dict unset wapp .csp
 } else {
 dict set wapp .csp $val
 }
}

```



```

}

Examine the bodies of all procedures in this program looking for
unsafe calls to various Wapp interfaces. Return a text string
containing warnings. Return an empty string if all is ok.
#
This routine is advisory only. It misses some constructs that are
dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
 set ln 0
 foreach x [split [info body $p] \n] {
 incr ln
 if {[regexp {^[\t]*wapp[\t]+([\n]+)} $x all tail]
 && [string index $tail 0]!="\173"
 && [regexp {[[$]} $tail]
 } {
 append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
 }
 if {[regexp {^[\t]*wapp-(subst|trim)[\t]+([\n]+)} $x all cx]} {
 append res "$p:$ln: unsafe \"wapp-$cx\" call: \"[string trim $x]\"\n"
 }
 }
 }
 return $res
}

Return a string that describes the current environment. Applications
might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
 if {[string index $var 0]=="."} continue
 append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

Tracing function for each HTTP request. This is overridden by wapp-start
if tracing is enabled.
#
proc wappInt-trace {} {}

```

```

Start up a listening socket. Arrange to invoke wappInt-new-connection
for each inbound HTTP connection.
#
port Listen on this TCP port. 0 means to select a port
that is not currently in use
#
wappmode One of "scgi", "server", or "local".
#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
 set type SCGI
 set server [list wappInt-new-connection wappInt-scgi-readable $wappmode]
 } else {
 set type HTTP
 set server [list wappInt-new-connection wappInt-http-readable $wappmode]
 }
 if {$wappmode=="local"} {
 set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
 set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
 wappInt-start-browser http://127.0.0.1:$port/
 } else {
 puts "Listening for $type requests on TCP port $port"
 }
}

Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
 exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
 exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
 exec firefox $url &
 }
}

This routine is a "socket -server" callback. The $chan, $ip, and $port
arguments are added by the socket command.
#
Arrange to invoke $callback when content is available on the new socket.
The $callback will process inbound HTTP or SCGI content.

```

```

#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
 .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
 # This happens after completing a CGI request
 exit 0
 } else {
 unset ::wappInt-$chan
 close $chan
 }
}

Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
 puts stderr "$msg\n$::errorInfo"
 wappInt-close-channel $chan
 }
}

proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {![dict exists $W .toread]} {
 # If the .toread key is not set, that means we are still reading
 # the header
 set line [string trimright [gets $chan]]
 set n [string length $line]
 if {$n>0} {
 if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
 dict append W .header $line
 } else {
 dict append W .header \n$line
 }
 }
 if {[string length [dict get $W .header]]>100000} {
 error "HTTP request header too big - possible DOS attack"
 }
 } elseif {$n==0} {
 # We have reached the blank line that terminates the header.
 global argv0
 }
}

```

```

set a0 [file normalize $argv0]
dict set W SCRIPT_FILENAME $a0
dict set W DOCUMENT_ROOT [file dir $a0]
if {[wappInt-parse-header $chan]} {
 catch {close $chan}
 return
}
set len 0
if {[dict exists $W CONTENT_LENGTH]} {
 set len [dict get $W CONTENT_LENGTH]
}
if {$len>0} {
 # Still need to read the query content
 dict set W .toread $len
} else {
 # There is no query content, so handle the request immediately
 set wapp $W
 wappInt-handle-request $chan 0
}
}
} else {
 # If .toread is set, that means we are reading the query content.
 # Continue reading until .toread reaches zero.
 set got [read $chan [dict get $W .toread]]
 dict append W CONTENT $got
 dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
 if {[dict get $W .toread]<=0} {
 # Handle the request as soon as all the query content is received
 set wapp $W
 wappInt-handle-request $chan 0
 }
}
}

Decode the HTTP request header.
#
This routine is always running inside of a [catch], so if
any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
 error "unsupported request method: \"[dict get $W REQUEST_METHOD]\""
 }
}

```

```

set uri [lindex $req 1]
set split_uri [split $uri ?]
set uri0 [lindex $split_uri 0]
if {[regexp {^[-.a-z0-9_]*$} $uri0]} {
 error "invalid request uri: \"$uri0\""
}
dict set W REQUEST_URI $uri0
dict set W PATH_INFO $uri0
set uri1 [lindex $split_uri 1]
dict set W QUERY_STRING $uri1
set n [length $hdr]
for {set i 1} {$i<$n} {incr i} {
 set x [lindex $hdr $i]
 if {[regexp {^(.+):+(.*)$} $x all name value]} {
 error "invalid header line: \"$x\""
 }
 set name [string toupper $name]
 switch -- $name {
 REFERER {set name HTTP_REFERER}
 USER-AGENT {set name HTTP_USER_AGENT}
 CONTENT-LENGTH {set name CONTENT_LENGTH}
 CONTENT-TYPE {set name CONTENT_TYPE}
 HOST {set name HTTP_HOST}
 COOKIE {set name HTTP_COOKIE}
 ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
 default {set name .hdr:$name}
 }
 dict set W $name $value
}
return 0
}

Decode the QUERY_STRING parameters from a GET request or the
application/x-www-form-urlencoded CONTENT from a POST request.
#
This routine sets the ".qp" element of the ::wapp dict as a signal
that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
 foreach qterm [split [dict get $wapp QUERY_STRING] &] {
 set qsplit [split $qterm =]
 set nm [lindex $qsplit 0]
 if {[regexp {[a-z][a-z0-9]*$} $nm]} {
 dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
 }
 }
 }
}

```

```

}
}
if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
 set ctype [dict get $wapp CONTENT_TYPE]
 if {$ctype=="application/x-www-form-urlencoded"} {
 foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
 set qsplitted [split $qterm =]
 set nm [lindex $qsplitted 0]
 if {[regexp {[a-z][-a-z0-9_]*} $nm]} {
 dict set wapp $nm [wappInt-decode-url [lindex $qsplitted 1]]
 }
 }
 }
} elseif {[string match multipart/form-data* $ctype]} {
 regexp {^(.*?)\r\n(.*)$} [dict get $wapp CONTENT] all divider body
 set ndiv [string length $divider]
 while {[string length $body]} {
 set idx [string first $divider $body]
 set unit [string range $body 0 [expr {$idx-3}]]
 set body [string range $body [expr {$idx+$ndiv+2}] end]
 if {[regexp {^Content-Disposition: form-data; (.*)\r\n\r\n(.*)$} \
 $unit unit_hdr content] &&
 [regexp {name="(.*)"; filename="(.*)"\r\nContent-Type: (.*)$} \
 $hdr hr name filename mimetype]} {
 dict set wapp $name.filename \
 [string map [list \\/ \\\\ \\\] $filename]
 dict set wapp $name.mimetype $mimetype
 dict set wapp $name.content $content
 }
 }
}
}
}
}
}
}
}

```

```

Invoke application-supplied methods to generate a reply to
a single HTTP request.
#
This routine always runs within [catch], so handle exceptions by
invoking [error].
#
proc wappInt-handle-request {chan useCgi} {
 global wapp
 dict set wapp .reply {}
 dict set wapp .mimetype {text/html; charset=utf-8}
 dict set wapp .reply-code {200 Ok}
 dict set wapp .csp {default-src 'self'}

 # Set up additional CGI environment values
 #

```

```

if {[dict exists $wapp HTTP_HOST]} {
 dict set wapp BASE_URL {}
} elseif {[dict exists $wapp HTTPS]} {
 dict set wapp BASE_URL https://[dict get $wapp HTTP_HOST]
} else {
 dict set wapp BASE_URL http://[dict get $wapp HTTP_HOST]
}
if {[dict exists $wapp REQUEST_URI]} {
 dict set wapp REQUEST_URI /
} elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
 # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
 # These need to be stripped off
 dict set wapp REQUEST_URI $newR
}
if {[dict exists $wapp SCRIPT_NAME]} {
 dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
} else {
 dict set wapp SCRIPT_NAME {}
}
if {[dict exists $wapp PATH_INFO]} {
 # If PATH_INFO is missing (ex: nginx) the construct it
 set URI [dict get $wapp REQUEST_URI]
 set skip [string length [dict get $wapp SCRIPT_NAME]]
 dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^(/[^\+](.*)$} [dict get $wapp PATH_INFO] all head tail]} {
 dict set wapp PATH_HEAD $head
 dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
 dict set wapp PATH_INFO {}
 dict set wapp PATH_HEAD {}
 dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

Parse query parameters from the query string, the cookies, and
POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
 foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
 set qsplit [split [string trim $qterm] =]
 set nm [lindex $qsplit 0]
 if {[regexp {[a-z]([-a-z0-9_]*$} $nm)} {
 dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
 }
 }
}
set same_origin 0

```

```

if {[dict exists $wapp HTTP_REFERER]} {
 set referer [dict get $wapp HTTP_REFERER]
 set base [dict get $wapp BASE_URL]
 if {$referer==$base || [string match $base/* $referer]} {
 set same_origin 1
 }
}
dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
 wappInt-decode-query-params
}

Invoke the application-defined handler procedure for this page
request. If an error occurs while running that procedure, generate
an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
 if {$mname!=" " && [length [info proc wapp-page-$mname]]>0} {
 wapp-page-$mname
 } else {
 wapp-default
 }
} msg]} {
 if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
 puts "ERROR: $::errorInfo"
 }
 wapp-reset
 wapp-reply-code "500 Internal Server Error"
 wapp-mimetype text/html
 wapp-trim {
 <h1>Wapp Application Error</h1>
 <pre>%html($::errorInfo)</pre>
 }
 dict unset wapp .new-cookies
}

Transmit the HTTP reply
#
if {$chan=="stdout"} {
 puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
 puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
 puts $chan "Server: wapp\r"
 puts $chan "Connection: close\r"
}

```



```

if {[dict exists $wapp .reply-extra]} {
 foreach {name value} [dict get $wapp .reply-extra] {
 puts $chan "$name: $value\r"
 }
}
if {[dict exists $wapp .csp]} {
 puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
}
set mimetype [dict get $wapp .mimetype]
puts $chan "Content-Type: $mimetype\r"
if {[dict exists $wapp .new-cookies]} {
 foreach {nm val} [dict get $wapp .new-cookies] {
 if {[regexp {[a-z][-a-z0-9_]*$} $nm]} {
 if {$val==""} {
 puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
 } else {
 set val [wappInt-enc-url $val]
 puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=^\r"
 }
 }
 }
}
if {[string match text/* $mimetype]} {
 set reply [encoding convertto utf-8 [dict get $wapp .reply]]
 if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
 catch {
 set x [zlib gzip $reply]
 set reply $x
 puts $chan "Content-Encoding: gzip\r"
 }
 }
} else {
 set reply [dict get $wapp .reply]
}
puts $chan "Content-Length: [string length $reply]\r"
puts $chan \r
puts $chan $reply
flush $chan
wappInt-close-channel $chan
}

```

```

This routine runs just prior to request-handler dispatch. The
default implementation is a no-op, but applications can override
to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

```

```

Process a single CGI request

```

```

#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
 CONTENT_LENGTH
 CONTENT_TYPE
 DOCUMENT_ROOT
 HTTP_ACCEPT_ENCODING
 HTTP_COOKIE
 HTTP_HOST
 HTTP_REFERER
 HTTP_USER_AGENT
 HTTPS
 PATH_INFO
 QUERY_STRING
 REMOTE_ADDR
 REQUEST_METHOD
 REQUEST_URI
 REMOTE_USER
 SCRIPT_FILENAME
 SCRIPT_NAME
 SERVER_NAME
 SERVER_PORT
 SERVER_PROTOCOL
 } {
 if {[info exists env($key)]} {
 dict set wapp $key $env($key)
 }
 }
 set len 0
 if {[dict exists $wapp CONTENT_LENGTH]} {
 set len [dict get $wapp CONTENT_LENGTH]
 }
 if {$len>0} {
 fconfigure stdin -translation binary
 dict set wapp CONTENT [read stdin $len]
 }
 dict set wapp WAPP_MODE cgi
 fconfigure stdout -translation binary
 wappInt-handle-request stdout 1
}

Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
 puts stderr "$msg\n$::errorInfo"
 wappInt-close-channel $chan
 }
}

```

```

}
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {[dict exists $W .toread]} {
 # If the .toread key is not set, that means we are still reading
 # the header.
 #
 # An SGI header is short. This implementation assumes the entire
 # header is available all at once.
 #
 set req [read $chan 15]
 set n [string length $req]
 scan $req %d:%s len hdr
 incr len [string length "$len:;"]
 append hdr [read $chan [expr {$len-15}]]
 foreach {nm val} [split $hdr \000] {
 if {$nm==";"} break
 dict set W $nm $val
 }
 set len 0
 if {[dict exists $W CONTENT_LENGTH]} {
 set len [dict get $W CONTENT_LENGTH]
 }
 if {$len>0} {
 # Still need to read the query content
 dict set W .toread $len
 } else {
 # There is no query content, so handle the request immediately
 set wapp $W
 wappInt-handle-request $chan 0
 }
 } else {
 # If .toread is set, that means we are reading the query content.
 # Continue reading until .toread reaches zero.
 set got [read $chan [dict get $W .toread]]
 dict append W CONTENT $got
 dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
 if {[dict get $W .toread]<=0} {
 # Handle the request as soon as all the query content is received
 set wapp $W
 wappInt-handle-request $chan 0
 }
 }
}

Start up the wapp framework. Parameters are a list passed as the
single argument.

```

```

#
-server $PORT Listen for HTTP requests on this TCP port $PORT
#
-local $PORT Listen for HTTP requests on 127.0.0.1:$PORT
#
-scgi $PORT Listen for SCGI requests on TCP port $PORT
#
-cgi Handle a single CGI request
#
With no arguments, the behavior is called "auto". In "auto" mode,
if the GATEWAY_INTERFACE environment variable indicates CGI, then run
as CGI. Otherwise, start an HTTP server bound to the loopback address
only, on an arbitrary TCP port, and automatically launch a web browser
on that TCP port.
#
Additional options:
#
-trace "puts" each request URL as it is handled, for
debugging
#
-lint Run wapp-safety-check on the application instead
of running the application itself
#
-Dvar=value Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
 set term [lindex $arglist $i]
 if {[string match --* $term]} {set term [string range $term 1 end]}
 switch -glob -- $term {
 -server {
 incr i;
 set mode "server"
 set port [lindex $arglist $i]
 }
 -local {
 incr i;
 set mode "local"
 set port [lindex $arglist $i]
 }
 -scgi {
 incr i;
 set mode "scgi"
 }
 }
 }
}

```

```

 set port [[index $arglist $i]
 }
 -cgi {
 set mode "cgi"
 }
 -trace {
 proc wappInt-trace {} {
 set q [wapp-param QUERY_STRING]
 set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
 if {$q!=""} {append uri ?$q}
 puts $uri
 }
 }
 -lint {
 set res [wapp-safety-check]
 if {$res!=""} {
 puts "Potential problems in this code:"
 puts $res
 exit 1
 } else {
 exit
 }
 }
 -D*=* {
 if {[regexp {^\.D([^\=]+)=(.*)$} $term all var val]} {
 set ::$var $val
 }
 }
 default {
 error "unknown option: $term"
 }
}
if {$mode=="auto"
 && [info exists env(GATEWAY_INTERFACE)]
 && [string match CGI/1.* $env(GATEWAY_INTERFACE)]
|| $mode=="cgi"
} {
 wappInt-handle-cgi-request
 return
}
if {$mode=="scgi"} {
 wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
 wappInt-start-listener $port server
} else {
 wappInt-start-listener $port local
}

```

```

vwait ::forever
}

Call this version 1.0
package provide wapp 1.0

End of wapp.tcl

Generate all header content for the output document
#
proc search_header { } {
 wapp-trim {
<!DOCTYPE html>
<html><head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="content-type" content="text/html; charset=UTF-8">
<link href="sqlite.css" rel="stylesheet">
<title>Search SQLite Documentation</title>
<!-- path= -->
</head>
<body>
<div class=nosearch>

<div><!-- IE hack to prevent disappearing logo --></div>
<div class="tagline desktoponly">
Small. Fast. Reliable.
Choose any three.
</div>
<div class="menu mainmenu">

Home
<li class='mobileonly'>Menu
<li class='wideonly'>About
<li class='desktoponly'>Documentation
<li class='desktoponly'>Download
<li class='wideonly'>License
<li class='desktoponly'>Support
<li class='desktoponly'>Purchase
<li class='search' id='search_menubutton'>
Search

</div>
<div class="menu submenu" id="submenu">

About
Documentation
Download

```

```

Support
Purchase

</div>
<div class="searchmenu" id="searchmenu">
<form method="GET" action="search">
<select name="s" id="searchtype">
<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
</form>
</div>
</div>
<script>
function toggle_div(nm) {
var w = document.getElementById(nm);
if(w.style.display=="block"){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if(w.style.display=="block"){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){ document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if(!location.origin.match || !location.origin.match(/http/)){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
var b = document.getElementById(btn);
if(x.style.display!='none'){
x.style.display = 'none';
}
}

```

```

b.innerHTML='show';
}else{
x.style.display = "";
b.innerHTML='hide';
}
return false;
}
</script>
</div>
}
}

#-----
Add an entry to the log database for the current query. Which
returns $nRes results.
#
proc search_add_log_entry {nRes} {
if {[wapp-param-exists donotlog]} return
sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/search.d/searchlog.db
db2 timeout 10000
set ip [wapp-param REMOTE_ADDR]
set query [wapp-param q]
db2 eval {
PRAGMA synchronous=OFF;
PRAGMA journal_mode=OFF;
BEGIN;
CREATE TABLE IF NOT EXISTS log(
ip, -- IP query was made from
query, -- Fts5 query string
nres, -- Number of results
timestamp DEFAULT CURRENT_TIMESTAMP
);
INSERT INTO log(ip, query, nres) VALUES($ip, $query, $nRes);
COMMIT;
}
db2 close
}

#-----
This command is similar to the builtin Tcl [time] command, except that
it only ever runs the supplied script once. Also, instead of returning
a string like "xxx microseconds per iteration", it returns "x.yy ms" or
"x.yy s", depending on the magnitude of the time spent running the
command. For example:
#
% ttime {after 1500}
1.50 s
% ttime {after 45}

```



```

45.02 ms
#
proc ttime {script} {
 set t [lindex [time [list uplevel $script]] 0]
 if {$t>1000000} { return [format "%.2f s" [expr {$t/1000000.0}]] }
 return [format "%.2f ms" [expr {$t/1000.0}]]
}

#-----
Do a search of the change log
#
proc searchchanges {} {
 set q [wapp-param q]
 if {$q==""} {return {}}
 if {[regexp -all \x22 $q] % 2} { append q \x22 }
 set x ""
 foreach word [split $q " "] {
 append x "[string map [list "\" "\"\""] $word]\\"
 }
 set q [string trim $x]
 set open {}
 set close {}
 set query {
 SELECT url, version, idx, highlight(change, 3, $open, $close) AS text
 FROM change($q) ORDER BY rowid ASC
 }
 wapp-trim {
 <p>Change log entries mentioning: %html($q)
 <table border=0>
 }
 set s2 "style=\"margin-top:0\""
 set s1 "style=\"font-size:larger; text-align:left\" class=nounderline"
 set prev ""
 db eval $query {
 if {$prev!=$version} {
 wapp-trim {
 <tr><td %unsafe($s1) valign=top> %html($version)
 <td><ul %unsafe($s2)>
 }
 set prev $version
 }
 wapp-subst {<li value=%html($idx)> (%html($idx)) %unsafe($text)\n}
 }
 wapp-trim {
 </table>
 <center><p>You can also see the entire
 changelog as a single page if you wish.</center>
 }
}

```

```

}

#-----
Do a search over all documentation other than the change log
#
proc searchresults { } {
 set q [wapp-param q]
 if {$q==""} {return ""}

 # Count the "" characters in $::A(q). If there is an odd number of
 # occurrences, add a " to the end of the query so that fts5 can parse
 # it without error.
 if {[regexp -all \x22 $q] % 2} { append q \x22 }

 # Set iStart to the index of the first result to display. Results are
 # indexed starting at zero from most to least relevant.
 #
 set iStart 0
 catch {set iStart [expr {[wapp-param i 0]*10}]}

 # Grab a list of rowid results.
 #
 set sql {
 SELECT rowid FROM page WHERE page MATCH $q
 ORDER BY srnk(page) DESC,
 rank * COALESCE(
 (SELECT percent FROM weight WHERE id=page.rowid), 100
);
 }
 if {[catch { set IRowid [db eval $sql] }] } {
 set x ""
 foreach word [split $q " "] {
 append x "[string map [list "\" "\"\""] $word]\\"
 }
 set q [string trim $x]
 set IRowid [db eval $sql]
 }

 set IRes [list]
 foreach rowid $IRowid {
 if {$rowid > 1000} {
 set parent [expr $rowid / 1000]
 lappend subsections($parent) $rowid
 } else {
 lappend IRes $rowid
 }
 }
}

```

```

set nRes [[length $IRes]
set IRes [lrange $IRes $iStart [expr $iStart+9]]

Add an entry to the log database.
#
search_add_log_entry $nRes

If there are no results, return a message to that effect.
#
if {[length $IRes] == 0} {
 wapp-subst {<p>No Results for: %html($q)\n}
}

HTML markup used to highlight keywords within FTS5 generated snippets.
#
set open {}
set close {}
set ellipsis { ... }

Grab the required data
#
db eval [string map [list %LIST% [join $iRowid ,]] {
 SELECT
 rowid AS parentid,
 snippet(page, 0, $open, $close, $ellipsis, 6) AS s_apis,
 snippet(page, 2, $open, $close, ", 40) AS s_title1,
 snippet(page, 3, $open, $close, $ellipsis, 40) AS s_title2,
 snippet(page, 4, $open, $close, $ellipsis, 40) AS s_content,
 url, rank
 FROM page($q)
 WHERE rowid IN (%LIST%)
}] X {
 foreach k [array names X] { set data($X(parentid),$k) [set X($k)] }
}

set i1 [expr {$iStart+1}]
set i2 [expr {($nRes < $iStart+10) ? $nRes : $iStart+10}]
wapp-trim {
 <table border=0>
 <p>Search results %html($i1)..%html($i2) of %html($nRes) for: %html($q)
}

foreach rowid $IRes {

 foreach a {parentid s_apis s_title1 s_content url rank} {
 set $a $data($rowid,$a)
 }
}

```

```

if {[info exists subsections($parentid)]} {
 set childid [lindex $subsections($parentid) 0]
 set link $data($childid,url)
 set hdr $data($childid,s_title2)

 if {$hdr==""} {
 set s_content ""
 } else {
 set s_content [subst {
 $hdr
 }]
 }

 append s_content " $data($childid,s_content)"
}

wapp-trim {<tr>
 <td valign=top style="line-height:150%">
 <div style="white-space:wrap;font-size:larger" class=nounderline>
 %unsafe($s_title1)
 <div style="float:right;font-size:smaller;color:#BBB">(%url($url))</div>
 </div>
 <div style="margin-left: 10ex; font:larger monospace">%unsafe($s_apis)</div>
 <div style="margin-left: 4ex; margin-bottom:1.5em">
 %unsafe($s_content)
 </div>
 </td>
}
}
wapp-subst {</table>\n}

```

```

If the query returned more than 10 results, add up to 10 links to
each set of 10 results (first link to results 1-10, second to 11-20,
third to 21-30, as required).
#
if {$nRes>10} {
 set s(0) {border:solid #044a64 1px;padding:1ex;margin:1ex;line-height:300%;}
 set s(1) "$s(0);background:#044a64;color:white"
 wapp-subst {<center><p>\n}
 for {set i 0} {$i < 10 && ($i*10)<$nRes} {incr i} {
 set style $s([expr {(($iStart/10)==$i)])
 wapp-trim {
 <a style="%html($style)"
 href="search?q=%qp($q)&i=%qp($i)">%html([expr $i+1])
 }
 }
 wapp-subst {</center>\n}
}

```

```

}
}

This is the main entry point into the search result page generator
#
proc wapp-default {} {
 wapp-content-security-policy {default-src 'self' 'unsafe-inline'}
 wapp-allow-xorigin-params
 if {[wapp-param-exists env]} {
 search_header
 wapp-trim {
 <h1>Environment Dump For Debugging</h1>
 <pre>%html([wapp-debug-env])</pre>
 }
 return
 }
}

When running using the built-in webserver in Wapp (in other words,
when not running as CGI) any filename that contains a "." loads
directly from the filesystem.
if {[wapp-param WAPP_MODE]!="cgi"
 && [string match *.* [wapp-param PATH_INFO]]
} {
 set altfile [file dir [wapp-param SCRIPT_FILENAME]][wapp-param PATH_INFO]
 set fd [open $altfile rb]
 fconfigure $fd -translation binary
 wapp-unsafe [read $fd]
 close $fd
 switch -glob -- $altfile {
 *.html {
 wapp-mimetype text/html
 }
 *.css {
 wapp-mimetype text/css
 }
 *.gif {
 wapp-mimetype image/gif
 }
 }
 return
}

search_header
sqlite3 db [file dir [wapp-param SCRIPT_FILENAME]]/search.d/search.db
set searchType [wapp-param s d]
if {$searchType=="c"} {
 set cmd searchchanges
} else {

```

```

set cmd searchresults
}
db transaction {
 set t [time {$cmd}]
}
wapp-trim {
 <center>
 <p>Page generated by FTS5 in about %html($t).
 </center>
 <script>
 window.addEventListener('load', function() {
 var w = document.getElementById("searchmenu");
 w.style.display = "block";
 w = document.getElementById("searchtype");
 w.value = "%string($searchType)"
 setTimeout(function(){
 var s = document.getElementById("searchbox");
 s.value = "%string([wapp-param q])"
 s.focus();
 s.select();
 }, 30);
 });
 </script>
}
}
wapp-start $argv

```

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/search  
 No license file was found, but licenses were detected in source scan.

data, so do not send the ".fullschema" output of a proprietary database

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/cli.html  
 No license file was found, but licenses were detected in source scan.

application is free to use the same <a href="#sqlite3">database connection</a> or the

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/capi3ref.html  
 No license file was found, but licenses were detected in source scan.

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domain and ensure that the code does not become contaminated with proprietary  
SQLite is in the public domain and does not require a license.  
the public domain. </li>  
have the legal right to dedicate the SQLite to the public domain, and

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/copyright.html

No license file was found, but licenses were detected in source scan.

is free to use SQLite from multiple threads, but it must make sure

Found in path(s):

\* /opt/cola/permits/1143446940\_1615628662.26/0/sqlite3-3-31-1-orig-www-1-tar-xz/www/custombuild.html

# 1.89 spring-security 2.3.3.RELEASE

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Version 2.0, January 2004

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## 1.90 iproute 3.14.0

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Version 2, June 1991

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## 1.94 curl 7.68.0-1ubuntu2.6

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# 1.95 libidn 2.2.0 2

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```
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```
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```

```
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# 1.96 spring-webflux 5.2.8.RELEASE

## 1.96.1 Available under license :

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Found in path(s):

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* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
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\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-  
jar/org/springframework/web/reactive/socket/server/upgrade/UndertowRequestUpgradeStrategy.java  
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 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 */
/**
 * A contract for inspecting and potentially modifying request data values such
 * as URL query parameters or form field values before they are rendered by a
 * view or before a redirect.
 *
 * <p>Implementations may use this contract for example as part of a solution
 * to provide data integrity, confidentiality, protection against cross-site
 * request forgery (CSRF), and others or for other tasks such as automatically
 * adding a hidden field to all forms and URLs.
 */
```

```
* <p>View technologies that support this contract can obtain an instance to
* delegate to via { @link RequestContext#getRequestDataValueProcessor()}.
*
* @author Rossen Stoyanchev
* @since 5.0
*/
```

Found in path(s):

```
* /opt/cola/permits/1138182584_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-
jar/org/springframework/web/reactive/result/view/RequestDataValueProcessor.java
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*/
```

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jar/org/springframework/web/reactive/result/method/annotation/RequestHeaderMethodArgumentResolver.java  
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jar/org/springframework/web/reactive/config/ResourceChainRegistration.java  
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\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-jar/org/springframework/web/reactive/function/server/ServerResponseExtensions.kt

\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-jar/org/springframework/web/reactive/function/client/ExchangeFilterFunctions.java

\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-jar/org/springframework/web/reactive/result/method/annotation/RequestPartMethodArgumentResolver.java

\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-jar/org/springframework/web/reactive/socket/client/UndertowWebSocketClient.java

\* /opt/cola/permits/1138182584\_1614269673.33/0/spring-webflux-5-2-8-release-sources-1-jar/org/springframework/web/reactive/result/method/RequestMappingInfoHandlerMapping.java

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2003, 2004, 2005, 2008 Theodore Ts'o <tytso@mit.edu>

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2013 Eric Sandeen <sandeen@redhat.com>  
2013 Rolf Fokkens <rolf@fokkens.nl>  
2013 Zeeshan Ali (Khattak) <zeeshanak@gnome.org>

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Adrian Bunk <bunk@stusta.de>

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## ## Source Code

The project maintains the following source code repositories:

\* <https://github.com/eclipse-ee4j/mail>

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## 1.103 urllib3 1.26.5

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# Contributions to the urllib3 project

## Creator & Maintainer

\* Andrey Petrov <andrey.petrov@shazow.net>

## Contributors

In chronological order:

\* victor.vde <<http://code.google.com/u/victor.vde/>>

\* HTTPS patch (which inspired HTTPSConnectionPool)

\* erikcederstrand <<http://code.google.com/u/erikcederstrand/>>

\* NTLM-authenticated HTTPSConnectionPool

\* Basic-authenticated HTTPSConnectionPool (merged into make\_headers)

\* niphlod <niphlod@gmail.com>

\* Client-verified SSL certificates for HTTPSConnectionPool

\* Response gzip and deflate encoding support

\* Better unicode support for filepost using StringIO buffers

\* btoconnor <brian@btoconnor.net>

\* Non-multipart encoding for POST requests

\* p.dobrogost <<http://code.google.com/u/@WBRSRIBZDhBFXQB6/>>

\* Code review, PEP8 compliance, benchmark fix

\* kennethreitz <me@kennethreitz.com>

\* Bugfixes, suggestions, Requests integration

\* georgemarshall <<https://github.com/georgemarshall>>

\* Bugfixes, Improvements and Test coverage

\* Thomas Kluyver <thomas@kluyver.me.uk>

\* Python 3 support

\* brandon-rhodes <<http://rhodesmill.org/brandon>>

\* Design review, bugfixes, test coverage.

\* studer <theo.studer@gmail.com>

\* IPv6 url support and test coverage

\* Shivaram Lingamneni <slingamn@cs.stanford.edu>

\* Support for explicitly closing pooled connections

- \* hartator <hartator@gmail.com>
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- \* Thomas Weischuh <thomas@t-8ch.de>
- \* Support for TLS SNI
- \* API unification of ssl\_version/cert\_reqs
- \* SSL fingerprint and alternative hostname verification
- \* Bugfixes in testsuite
  
- \* Sune Kirkeby <mig@ibofobi.dk>
- \* Optional SNI-support for Python 2 via PyOpenSSL.
  
- \* Marc Schlaich <marc.schlaich@gmail.com>
- \* Various bugfixes and test improvements.
  
- \* Bryce Boe <bbzbryce@gmail.com>
- \* Correct six.moves conflict
- \* Fixed pickle support of some exceptions
  
- \* Boris Figovsky <boris.figovsky@ravellosystems.com>
- \* Allowed to skip SSL hostname verification
  
- \* Cory Benfield <<https://lukasa.co.uk/about/>>
- \* Stream method for Response objects.
- \* Return native strings in header values.
- \* Generate 'Host' header when using proxies.
  
- \* Jason Robinson <jaywink@basshero.org>
- \* Add missing WrappedSocket.fileno method in PyOpenSSL
  
- \* Audrius Butkevicius <audrius.butkevicius@elastichosts.com>
- \* Fixed a race condition
  
- \* Stanislav Vitkovskiy <stas.vitkovsky@gmail.com>
- \* Added HTTPS (CONNECT) proxy support
  
- \* Stephen Holsapple <sholsapp@gmail.com>
- \* Added abstraction for granular control of request fields
  
- \* Martin von Gagern <Martin.vGagern@gmx.net>
- \* Support for non-ASCII header parameters
  
- \* Kevin Burke <kev@inburke.com> and Pavel Kirichenko <juanych@yandex-team.ru>
- \* Support for separate connect and request timeouts
  
- \* Peter Waller <p@pwaller.net>
- \* HTTPResponse.tell() for determining amount received over the wire



- \* Nipunn Koorapati <nipunn1313@gmail.com>
- \* Ignore default ports when comparing hosts for equality
  
- \* Danilo @dbrgn <https://dbrgn.ch/>
- \* Disabled TLS compression by default on Python 3.2+
- \* Disabled TLS compression in pyopenssl contrib module
- \* Configurable cipher suites in pyopenssl contrib module
  
- \* Roman Bogorodskiy <roman.bogorodskiy@ericsson.com>
- \* Account retries on proxy errors
  
- \* Nicolas Delaby <nicolas.delaby@ezeep.com>
- \* Use the platform-specific CA certificate locations
  
- \* Josh Schneier <https://github.com/jschneier>
- \* HTTPHeaderDict and associated tests and docs
- \* Bugfixes, docs, test coverage
  
- \* Tahia Khan <http://tahia.tk/>
- \* Added Timeout examples in docs
  
- \* Arthur Grunseid <https://grunseid.com>
- \* source\_address support and tests (with https://github.com/bui)
  
- \* Ian Cordasco <graffatcolmingov@gmail.com>
- \* PEP8 Compliance and Linting
- \* Add ability to pass socket options to an HTTP Connection
  
- \* Erik Tollerud <erik.tollerud@gmail.com>
- \* Support for standard library io module.
  
- \* Krishna Prasad <kprasad.iitd@gmail.com>
- \* Google App Engine documentation
  
- \* Aaron Meurer <asmeurer@gmail.com>
- \* Added Url.url, which unparses a Url
  
- \* Evgeny Kapun <abacabadabacaba@gmail.com>
- \* Bugfixes
  
- \* Benjamin Meyer <bm\_witness@yahoo.com>
- \* Security Warning Documentation update for proper capture
  
- \* Shivan Sornarajah <github@sornars.com>
- \* Support for using ConnectionPool and PoolManager as context managers.
  
- \* Alex Gaynor <alex.gaynor@gmail.com>
- \* Updates to the default SSL configuration

- \* Tomas Tomecek <tomecek@redhat.com>
- \* Implemented generator for getting chunks from chunked responses.
  
- \* tlynn <https://github.com/tlynn>
- \* Respect the warning preferences at import.
  
- \* David D. Riddle <ddriddle@illinois.edu>
- \* IPv6 bugfixes in testsuite
  
- \* Thea Flowers <magicalgirl@google.com>
- \* App Engine environment tests.
- \* Documentation re-write.
  
- \* John Krauss <https://github.com/talos>
- \* Clues to debugging problems with `cryptography` dependency in docs
  
- \* Disassem <https://github.com/Disassem>
- \* Fix pool-default headers not applying for url-encoded requests like GET.
  
- \* James Atherfold <jlatherfold@hotmail.com>
- \* Bugfixes relating to cleanup of connections during errors.
  
- \* Christian Pedersen <https://github.com/chripede>
- \* IPv6 HTTPS proxy bugfix
  
- \* Jordan Moldow <https://github.com/jmoldow>
- \* Fix low-level exceptions leaking from ``HTTPResponse.stream()``.
- \* Bugfix for ``ConnectionPool.urlopen(release\_conn=False)``.
- \* Creation of ``HTTPConnectionPool.ResponseCls``.
  
- \* Predrag Gruevski <https://github.com/obi1kenobi>
- \* Made cert digest comparison use a constant-time algorithm.
  
- \* Adam Talsma <https://github.com/a-tal>
- \* Bugfix to ca\_cert file paths.
  
- \* Evan Meagher <https://evanmeagher.net>
- \* Bugfix related to `memoryview` usage in PyOpenSSL adapter
  
- \* John Vandenberg <jayvdb@gmail.com>
- \* Python 2.6 fixes; pyflakes and pep8 compliance
  
- \* Andy Caldwell <andy.m.caldwell@googlemail.com>
- \* Bugfix related to reusing connections in indeterminate states.
  
- \* Ville Skytt <ville.skytta@iki.fi>
- \* Logging efficiency improvements, spelling fixes, Travis config.

- \* Shige Takeda <smtakeda@gmail.com>
- \* Started Recipes documentation and added a recipe about handling concatenated gzip data in HTTP response
  
- \* Jess Shapiro <jesse@jesseshapiro.net>
- \* Various character-encoding fixes/tweaks
- \* Disabling IPv6 DNS when IPv6 connections not supported
  
- \* David Foster <http://dafoster.net/>
- \* Ensure order of request and response headers are preserved.
  
- \* Jeremy Cline <jeremy@jcline.org>
- \* Added connection pool keys by scheme
  
- \* Aviv Palivoda <palaviv@gmail.com>
- \* History list to Retry object.
- \* HTTPResponse contains the last Retry object.
  
- \* Nate Prewitt <nate.prewitt@gmail.com>
- \* Ensure timeouts are not booleans and greater than zero.
- \* Fixed infinite loop in ``stream`` when amt=None.
- \* Added length\_remaining to determine remaining data to be read.
- \* Added enforce\_content\_length to raise exception when incorrect content-length received.
  
- \* Seth Michael Larson <sethmichaellarson@protonmail.com>
- \* Created selectors backport that supports PEP 475.
  
- \* Alexandre Dias <alex.dias@smarkets.com>
- \* Don't retry on timeout if method not in whitelist
  
- \* Moinuddin Quadri <moin18@gmail.com>
- \* Lazily load idna package
  
- \* Tom White <s6yg1ez3@mail2tor.com>
- \* Made SOCKS handler differentiate socks5h from socks5 and socks4a from socks4.
  
- \* Tim Burke <tim.burke@gmail.com>
- \* Stop buffering entire deflate-encoded responses.
  
- \* Tuukka Mustonen <tuukka.mustonen@gmail.com>
- \* Add counter for status\_forcelist retries.
  
- \* Erik Rose <erik@mozilla.com>
- \* Bugfix to pyopenssl vendoring
  
- \* Wolfgang Richter <wolfgang.richter@gmail.com>
- \* Bugfix related to loading full certificate chains with PyOpenSSL backend.

- \* Mike Miller <github@mikeage.net>
- \* Logging improvements to include the HTTP(S) port when opening a new connection
  
- \* Ioannis Tziakos <mail@itziakos.gr>
- \* Fix ``util.selectors.\_fileobj\_to\_fd`` to accept ``long``.
- \* Update appveyor tox setup to use the 64bit python.
  
- \* Akamai (through Jess Shapiro) <jshapiro@akamai.com>
- \* Ongoing maintenance; 2017-2018
  
- \* Dominique Leuenberger <dimstar@opensuse.org>
- \* Minor fixes in the test suite
  
- \* Will Bond <will@wbond.net>
- \* Add Python 2.6 support to ``contrib.securetransport``
  
- \* Aleksei Alekseev <alekseev.yeskela@gmail.com>
- \* using auth info for socks proxy
  
- \* Chris Wilcox <git@crwilcox.com>
- \* Improve contribution guide
- \* Add ``HTTPResponse.geturl`` method to provide ``urllib2.urlopen().geturl()`` behavior
  
- \* Bruce Merry <https://www.brucemerry.org.za>
- \* Fix leaking exceptions when system calls are interrupted with zero timeout
  
- \* Hugo van Kemenade <https://github.com/hugovk>
- \* Drop support for EOL Python 2.6
  
- \* Tim Bell <https://github.com/timb07>
- \* Bugfix for responses with Content-Type: message/\* logging warnings
  
- \* Justin Bramley <https://github.com/jbramleycl>
- \* Add ability to handle multiple Content-Encodings
  
- \* Katsuhiko YOSHIDA <https://github.com/kyoshidajp>
- \* Remove Authorization header regardless of case when redirecting to cross-site
  
- \* James Meickle <https://permadeath.com/>
- \* Improve handling of Retry-After header
  
- \* Chris Jerdonek <chris.jerdonek@gmail.com>
- \* Remove a spurious TypeError from the exception chain inside HTTPConnectionPool.\_make\_request(), also for BaseExceptions.
  
- \* Jorge Lopez Silva <https://github.com/jalopezsilva>
- \* Added support for forwarding requests through HTTPS proxies.

- \* Benno Rice <benno@jeamland.net>
- \* Allow cadata parameter to be passed to underlying ``SSLContext.load\_verify\_locations()``.
  
- \* Keiichi Kobayashi <abok.1k@gmail.com>
- \* Rename VerifiedHTTPSConnection to HTTPSConnection
  
- \* Himanshu Garg <garg\_himanshu@outlook.com>
- \* DOC & LICENSE Update
  
- \* Hod Bin Noon <bin.noon.hod@gmail.com>
- \* Test improvements
  
- \* Chris Olufson <tycarac@gmail.com>
- \* Fix for connection not being released on HTTP redirect and response not preloaded
  
- \* [Bastiaan Bakker] <<https://github.com/bastiaanb>>
- \* Support for logging session keys via environment variable ``SSLKEYLOGFILE`` (Python 3.8+)
  
- \* [Ezzeri Esa] <<https://github.com/savarin>>
- \* Ports and extends on types from typedshed
  
- \* [Your name or handle] <[email or website]>
- \* [Brief summary of your changes]

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# 1.104 golang 1.8

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Please keep the list sorted.

Aamir Khan <syst3m.w0rm@gmail.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Langley <agl@golang.org>
Adrian Nos <nos.adrian@gmail.com>
```

Adrian O'Grady <elpollouk@gmail.com>  
Adrien Bustany <adrien-xx-google@bustany.org>  
Acio Jnior <aeciodantasjunior@gmail.com>  
Ahmed Waheed Moanes <oneofone@gmail.com>  
Ahmy Yulrizka <yulrizka@gmail.com>  
Aiden Scandella <ai@uber.com>  
Ainar Garipov <gugl.zadolbal@gmail.com>  
Akihiro Suda <suda.kyoto@gmail.com>  
Akshat Kumar <seed@mail.nanosouffle.net>  
Alan Donovan <adonovan@google.com>  
Alan Shreve <alan@inconshreveable.com>  
Albert Nigmatzianov <albertnigma@gmail.com>  
Albert Strasheim <fullung@gmail.com>  
Albert Yu <yukinying@gmail.com>  
Alberto Bertogli <albertito@blitiri.com.ar>  
Alberto Donizetti <alb.donizetti@gmail.com>  
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>  
Aleksandar Dezelin <dezelin@gmail.com>  
Alessandro Arzilli <alessandro.arzilli@gmail.com>  
Alessandro Baffa <alessandro.baffa@gmail.com>  
Alex A Skinner <alex@lx.lc>  
Alex Brainman <alex.brainman@gmail.com>  
Alex Bramley <abramley@google.com>  
Alex Browne <stephenalexbrowne@gmail.com>  
Alex Carol <alex.carol.c@gmail.com>  
Alex Jin <toalexjin@gmail.com>  
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>  
Alex Schroeder <alex@gnu.org>  
Alex Sergeyev <abc@alexsergeyev.com>  
Alex Vaghin <crhyme@google.com>  
Alexander Demakin <alexander.demakin@gmail.com>  
Alexander Dring <email@alex.d.ch>  
Alexander Larsson <alexander.larsson@gmail.com>  
Alexander Menzhinsky <amenzhinsky@gmail.com>  
Alexander Morozov <lk4d4math@gmail.com>  
Alexander Neumann <alexander@bumpen.de>  
Alexander Orlov <alexander.orlov@loxal.net>  
Alexander Reece <awreece@gmail.com>  
Alexander Surma <surma@surmair.de>  
Alexander Zhavnerchik <alex.vizor@gmail.com>  
Alexander Zolotov <goldifit@gmail.com>  
Alexandre Cesaro <alexandre.cesaro@gmail.com>  
Alexandre Fiori <fiorix@gmail.com>  
Alexandre Normand <alexandre.normand@gmail.com>  
Alexandru Mooi <brtznr@gmail.com>  
Alexei Sholik <alcosholik@gmail.com>  
Alexey Borzenkov <snaury@gmail.com>  
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>

Alexis Imperial-Legrand <ail@google.com>  
Aliaksandr Valialkin <valyala@gmail.com>  
Alif Rachmawadi <subosito@gmail.com>  
Allan Simon <allan.simon@supinfo.com>  
Alok Menghrajani <alok.menghrajani@gmail.com>  
Amir Mohammad Saied <amir@gluegadget.com>  
Amrut Joshi <amrut.joshi@gmail.com>  
Andre Nathan <andrenth@gmail.com>  
Andrea Spadaccini <spadaccio@google.com>  
Andreas Auernhammer <aead@mail.de>  
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>  
Andreas Litt <andreas.litt@gmail.com>  
Andrei Korzhevskii <a.korzhevskiy@gmail.com>  
Andrei Vieru <euvieru@gmail.com>  
Andres Erbsen <andreser@google.com>  
Andrew Austin <andrewaact@gmail.com>  
Andrew Balholm <andybalholm@gmail.com>  
Andrew Bonventre <andybons@chromium.org>  
Andrew Bursavich <abursavich@gmail.com>  
Andrew Ekstedt <andrew.ekstedt@gmail.com>  
Andrew Etter <andrew.etter@gmail.com>  
Andrew Gerrand <adg@golang.org>  
Andrew Harding <andrew@spacemonkey.com>  
Andrew Lutomirski <andy@luto.us>  
Andrew Pilloud <andrewpilloud@igneoussystem.com>  
Andrew Pogrebnoy <absourd.noise@gmail.com>  
Andrew Pritchard <awpritchard@gmail.com>  
Andrew Radev <andrey.radev@gmail.com>  
Andrew Skiba <skibaa@gmail.com>  
Andrew Szeto <andrew@jabagawee.com>  
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>  
Andrew Wilkins <axwalk@gmail.com>  
Andrew Williams <williams.andrew@gmail.com>  
Andrey Mirtchovski <mirtchovski@gmail.com>  
Andrey Petrov <andrey.petrov@shazow.net>  
Andriy Lytvynov <lytvynov.a.v@gmail.com>  
Andy Balholm <andy@balholm.com>  
Andy Davis <andy@bigandian.com>  
Andy Finkenstadt <afinkenstadt@zynga.com>  
Andy Maloney <asmaloney@gmail.com>  
Anfernee Yongkun Gui <anfernee.gui@gmail.com>  
Angelo Bulfone <mbulfone@gmail.com>  
Anh Hai Trinh <anh.hai.trinh@gmail.com>  
Anmol Sethi <anmol@aubble.com>  
Anschel Schaffer-Cohen <anschelsc@gmail.com>  
Anthony Canino <anthony.canino1@gmail.com>  
Anthony Eufemio <anthony.eufemio@gmail.com>  
Anthony Martin <ality@pbrane.org>



Anthony Starks <ajstarks@gmail.com>  
Anthony Woods <awoods@raintank.io>  
Antonio Bibiano <antbbn@gmail.com>  
Antonio Murdaca <runcom@redhat.com>  
Apisak Darakananda <pongad@gmail.com>  
Aram Hvrneanu <aram@mgk.ro>  
Areski Belaid <areski@gmail.com>  
Arkadi Pyuro <arkadi@google.com>  
Arlo Breault <arlolra@gmail.com>  
Arnaud Ysmal <arnaud.ysmal@gmail.com>  
Arne Hormann <arnehormann@gmail.com>  
Arnout Engelen <arnout@bzzt.net>  
Aron Nopanen <aron.nopanen@gmail.com>  
Artyom Pervukhin <artyom.pervukhin@gmail.com>  
Arvindh Rajesh Tamilmani <art@a-30.net>  
Asim Shankar <asimshankar@gmail.com>  
Atin Malaviya <amalaviy@akamai.com>  
Ato Araki <ato.araki@gmail.com>  
Audrey Lim <audreylh@gmail.com>  
Augusto Roman <aroman@gmail.com>  
Aulus Egnatius Varialus <varialus@gmail.com>  
Austin Clements <austin@google.com> <aclements@csail.mit.edu>  
awaw fumin <awawfumin@gmail.com>  
Ayanamist Yang <ayanamist@gmail.com>  
Aymerick Jhanne <aymerick@jehanne.org>  
Baiju Muthukadan <baiju.m.mail@gmail.com>  
Balazs Lecz <leczb@google.com>  
Ben Burkert <ben@benburkert.com>  
Ben Eitzen <eitzenb@golang.org>  
Ben Fried <ben.fried@gmail.com>  
Ben Lubar <ben.lubar@gmail.com>  
Ben Lynn <benlynn@gmail.com>  
Ben Olive <sionide21@gmail.com>  
Benjamin Black <b@b3k.us>  
Benjamin Prosnitz <bprosnitz@google.com>  
Benjamin Wester <bwester@squareup.com>  
Benny Siegert <bsiegert@gmail.com>  
Benoit Sigoure <tsunanet@gmail.com>  
Berengar Lehr <Berengar.Lehr@gmx.de>  
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>  
Bill O'Farrell <billo@ca.ibm.com>  
Bill Thiede <couchmoney@gmail.com>  
Billie Harold Cleek <bhcleek@gmail.com>  
Billy Lynch <wlynch@google.com>  
Bjorn Tillenius <bjorn@tillenius.me>  
Bjorn Tipling <bjorn.tipling@gmail.com>  
Blake Gentry <blakesgentry@gmail.com>  
Blake Miserany <blake.miserany@gmail.com>

Blixt <me@blixt.nyc>  
Bobby Powers <bobbypowers@gmail.com>  
Boris Nagaev <nagaev@google.com>  
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>  
Brad Garcia <bgarcia@golang.org>  
Braden Bassingthwaite <bbassingthwaite@vendasta.com>  
Brady Catherman <brady@gmail.com>  
Brady Sullivan <brady@bsull.com>  
Brandon Gilmore <varz@google.com>  
Brendan Daniel Tracey <tracey.brendan@gmail.com>  
Brendan O'Dea <bod@golang.org>  
Brett Cannon <bcannon@gmail.com>  
Brian Dellisanti <briandellisanti@gmail.com>  
Brian G. Merrell <bgmerrell@gmail.com>  
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>  
Brian Kennedy <btkenedy@gmail.com>  
Brian Ketelsen <bketelsen@gmail.com>  
Brian Slesinsky <skybrian@google.com>  
Brian Smith <ohohvi@gmail.com>  
Bryan Alexander <Kozical@msn.com>  
Bryan C. Mills <bcmills@google.com>  
Bryan Chan <bryan.chan@ca.ibm.com>  
Bryan Ford <brynosaurus@gmail.com>  
Caine Tighe <arctanofyourface@gmail.com>  
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>  
Caleb Spare <cespare@gmail.com>  
Carl Chatfield <carlchatfield@gmail.com>  
Carl Jackson <carl@stripe.com>  
Carl Johnson <me@carlmjohnson.net>  
Carl Mastrangelo <notcarl@google.com>  
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>  
Carlos Castillo <cookieo9@gmail.com>  
Carlos Cirello <uldericofilho@gmail.com>  
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>  
Cary Hull <chull@google.com>  
Case Nelson <case.nelson@gmail.com>  
Casey Marshall <casey.marshall@gmail.com>  
Catalin Nicutar <cnicutar@google.com>  
Catalin Patulea <catalinp@google.com>  
Cedric Staub <cs@squareup.com>  
Cezar S Espinola <cezarsa@gmail.com>  
ChaiShushan <chaishushan@gmail.com>  
Charles L. Dorian <cldorian@gmail.com>  
Charles Lee <zombie.fml@gmail.com>  
Charles Weill <weill@google.com>  
Cherry Zhang <cherryz@google.com>  
Chris Broadfoot <cbro@golang.org>  
Chris Dollin <ehog.hedge@gmail.com>

Chris Farmiloe <chrisfarms@gmail.com>  
Chris Hines <chris.cs.guy@gmail.com>  
Chris Howey <howeyc@gmail.com>  
Chris Hundt <hundt@google.com>  
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>  
Chris Kastorff <encryptio@gmail.com>  
Chris Lennert <calennert@gmail.com>  
Chris Manghane <cmang@golang.org>  
Chris McGee <sirnewton\_01@yahoo.ca> <newton688@gmail.com>  
Chris Stockton <chrisstocktonaz@gmail.com>  
Chris Zou <chriszou@ca.ibm.com>  
Christian Couder <chriscool@tuxfamily.org>  
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>  
Christine Hansmann <chhansmann@gmail.com>  
Christoffer Buchholz <christoffer.buchholz@gmail.com>  
Christoph Hack <christoph@tux21b.org>  
Christopher Cahoon <chris.cahoon@gmail.com>  
Christopher Guiney <chris@guiney.net>  
Christopher Nelson <nadiasvertex@gmail.com>  
Christopher Nielsen <m4dh4tt3r@gmail.com>  
Christopher Redden <christopher.redden@gmail.com>  
Christopher Swenson <cswenson@google.com>  
Christopher Wedgwood <cw@f00f.org>  
Christy Perez <christy@linux.vnet.ibm.com>  
CL Sung <clsung@gmail.com> <cl\_sung@htc.com>  
Clement Skau <clementska@gmail.com>  
Colby Ranger <cranger@google.com>  
Colin Cross <ccross@android.com>  
Colin Edwards <colin@recursivepenguin.com>  
Colin Kennedy <moshen.colin@gmail.com>  
Conrad Irwin <conrad.irwin@gmail.com>  
Conrad Meyer <cemeyer@cs.washington.edu>  
Corey Thomasson <cthom.lists@gmail.com>  
Cosmos Nicolaou <cnicolaou@google.com>  
Cristian Staretu <unclejacksons@gmail.com>  
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>  
Cyrill Schumacher <cyrrill@schumacher.fm>  
Damian Gryski <dgryski@gmail.com>  
Damien Neil <dneil@google.com>  
Dan Caddigan <goldcaddy77@gmail.com>  
Dan Callahan <dan.callahan@gmail.com>  
Dan Harrington <harringtond@google.com>  
Dan Jacques <dnj@google.com>  
Dan Peterson <dpiddy@gmail.com>  
Dan Pupius <dan@medium.com>  
Dan Sinclair <dan.sinclair@gmail.com>  
Daniel Fleischman <danielfleischman@gmail.com>  
Daniel Johansson <dajo2002@gmail.com>

Daniel Kerwin <d.kerwin@gini.net>  
Daniel Krech <eikeon@eikeon.com>  
Daniel Lidn <daniel.liden.87@gmail.com>  
Daniel Mart <mvdan@mvdan.cc>  
Daniel Morsing <daniel.morsing@gmail.com>  
Daniel Nadasi <dnadasi@google.com>  
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>  
Daniel Skinner <daniel@dasa.cc>  
Daniel Speichert <daniel@speichert.pl>  
Daniel Theophanes <kardianos@gmail.com>  
Daria Kolistratova <daria.kolistratova@intel.com>  
Darren Elwood <darren@textnode.com>  
Datong Sun <dndx@idndx.com>  
Dave Borowitz <dborowitz@google.com>  
Dave Bort <dbort@golang.org>  
Dave Cheney <dave@cheney.net>  
Dave Day <djd@golang.org>  
Dave Grijalva <dgrijalva@ngmoco.com>  
David Anderson <danderson@google.com>  
David Barnett <dbarnett@google.com>  
David Benjamin <davidben@google.com>  
David Brophy <dave@brophy.uk>  
David Brgin <676c7473@gmail.com>  
David Calavera <david.calavera@gmail.com>  
David Chase <drchase@google.com>  
David Covert <davidhcovert@gmail.com>  
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>  
David du Colombier <0intro@gmail.com>  
David Forsythe <dforsythe@gmail.com>  
David G. Andersen <dave.andersen@gmail.com>  
David Glasser <glasser@meteor.com>  
David Howden <dhowden@gmail.com>  
David Hubbard <dsp@google.com>  
David Jakob Fritz <david.jakob.fritz@gmail.com>  
David Lazar <lazard@golang.org>  
David Leon Gil <coruus@gmail.com>  
David McLeish <davemc@google.com>  
David Presotto <presotto@gmail.com>  
David R. Jenni <david.r.jenni@gmail.com>  
David Sansome <me@davidsansome.com>  
David Stainton <dstainton415@gmail.com>  
David Symonds <dsymonds@golang.org>  
David Thomas <davidthomas426@gmail.com>  
David Titarenco <david.titarenco@gmail.com>  
Davies Liu <davies.liu@gmail.com>  
Dean Prichard <dean.prichard@gmail.com>  
Deepak Jois <deepak.jois@gmail.com>  
Denis Bernard <db047h@gmail.com>

Denis Brandolini <denis.brandolini@gmail.com>  
Denis Nagorny <denis.nagorny@intel.com>  
Denys Honsiorovskiy <honsiorovskiy@gmail.com>  
Derek Buitenhuis <derek.buitenhuis@gmail.com>  
Derek Che <drc@yahoo-inc.com>  
Derek Parker <parkerderek86@gmail.com>  
Derek Shockey <derek.shockey@gmail.com>  
Devon H. O'Dell <devon.odell@gmail.com>  
Dhaivat Pandit <dhaivatpandit@gmail.com>  
Dhananjay Nakrani <dhananjayn@google.com>  
Dhiru Kholia <dhiru.kholia@gmail.com>  
Didier Spezia <didier.06@gmail.com>  
Dimitri Tcaciuc <dtcaciuc@gmail.com>  
Dirk Gadsden <dirk@esherido.com>  
Diwaker Gupta <diwakergupta@gmail.com>  
Dmitri Popov <operator@cv.dp-net.com>  
Dmitri Shuralyov <shurcool@gmail.com>  
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>  
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>  
Dmitriy Vyukov <dvyukov@google.com>  
Dmitry Chestnykh <dchest@gmail.com>  
Dmitry Savintsev <dsavints@gmail.com>  
Dmitry Yakunin <nonamezeil@gmail.com>  
Dominik Honnef <dominik.honnef@gmail.com>  
Dominik Vogt <vogt@linux.vnet.ibm.com>  
Donald Huang <don.hcd@gmail.com>  
Donovan Hide <donovanhide@gmail.com>  
Doug Anderson <douga@google.com>  
Drew Hintz <adhintz@google.com>  
Duncan Holm <mail@frou.org>  
Dustin Carlino <dcarlino@google.com>  
Dustin Herbison <djherbis@gmail.com>  
Dustin Long <dustmop@gmail.com>  
Dustin Sallings <dsallings@gmail.com>  
Dustin Shields-Cloues <dcloues@gmail.com>  
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>  
Eden Li <eden.li@gmail.com>  
Edward Muller <edwardam@interlix.com>  
Egon Elbre <egonelbre@gmail.com>  
Ehren Kret <ehren.kret@gmail.com>  
Eivind Uggedal <eivind@uggedal.com>  
Elias Naur <elias.naur@gmail.com>  
Elliot Morrison-Reed <elliottmr@gmail.com>  
Emil Hessman <c.emil.hessman@gmail.com> <emil@hessman.se>  
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>  
Eoghan Sherry <ejsherry@gmail.com>  
Eric Clark <zerohp@gmail.com>  
Eric Engestrom <eric@engestrom.ch>

Eric Garrido <ekg@google.com>  
Eric Koleda <ekoleda+devrel@google.com>  
Eric Lagergren <ericscottlagergren@gmail.com>  
Eric Milliken <emilliken@gmail.com>  
Eric Roshan-Eisner <eric.d.eisner@gmail.com>  
Erik Aigner <aigner.erik@gmail.com>  
Erik Dubbelboer <erik@dubbelboer.com>  
Erik St. Martin <alakriti@gmail.com>  
Erik Staab <estaab@google.com>  
Erik Westrup <erik.westrup@gmail.com>  
Ernest Chiang <ernest\_chiang@htc.com>  
Esko Luontola <esko.luontola@gmail.com>  
Ethan Burns <eaburns@google.com>  
Ethan Miller <eamiller@us.ibm.com>  
Euan Kemp <euank@euank.com>  
Evan Broder <evan@stripe.com>  
Evan Brown <evanbrown@google.com>  
Evan Kroske <evankroske@google.com>  
Evan Martin <evan.martin@gmail.com>  
Evan Phoenix <evan@phx.io>  
Evan Shaw <chickencha@gmail.com>  
Ewan Chou <coocood@gmail.com>  
Fabian Wickborn <fabian@wickborn.net>  
Fabrizio Milo <mistobaan@gmail.com>  
Faiyaz Ahmed <ahmedf@vmware.com>  
Fan Hongjian <fan.howard@gmail.com>  
Fatih Arslan <fatih@arslan.io>  
Fazlul Shahriar <fshahriar@gmail.com>  
Federico Simoncelli <fsimonce@redhat.com>  
Fedor Indutny <fedor@indutny.com>  
Felix Geisendrfer <haimuiba@gmail.com>  
Filippo Valsorda <hi@filippo.io>  
Firmansyah Adiputra <frm.adiputra@gmail.com>  
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>  
Florian Weimer <fw@deneb.enyo.de>  
Florin Patan <florinpatan@gmail.com>  
Folke Behrens <folke@google.com>  
Ford Hurley <ford.hurley@gmail.com>  
Francesc Campoy <campoy@golang.org>  
Francisco Claude <fclaude@recoded.cl>  
Francisco Souza <franciscosouza@gmail.com>  
Frederick Kelly Mayle III <frederickmayle@gmail.com>  
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>  
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>  
Frits van Bommel <fvbommel@gmail.com>  
Fumitoshi Ukai <ukai@google.com>  
Gaal Yahas <gaal@google.com>  
Gabriel Aszalos <gabriel.aszalos@gmail.com>

Gabriel Russell <gabriel.russell@gmail.com>  
Gareth Paul Jones <gpj@foursquare.com>  
Garrick Evans <garrick@google.com>  
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>  
Gary Elliott <garyelliott@google.com>  
Gaurish Sharma <contact@aurishsharma.com>  
Gautham Thambidorai <gautham.dorai@gmail.com>  
Geert-Johan Riemer <gjr19912@gmail.com>  
Geoffroy Lorieux <lorieux.g@gmail.com>  
Georg Reinke <guelfey@gmail.com>  
George Shammas <george@shamm.as> <georgyo@gmail.com>  
Gerasimos Dimitriadis <gedimitr@gmail.com>  
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>  
Giles Lean <giles.lean@pobox.com>  
Giovanni Bajo <rasky@develer.com>  
Giulio Iotti <dullgiulio@gmail.com>  
Gleb Stepanov <glebstepanov1992@gmail.com>  
Glenn Brown <glennb@google.com>  
Glenn Lewis <gmlewis@google.com>  
Gordon Klaus <gordon.klaus@gmail.com>  
Graham King <graham4king@gmail.com>  
Graham Miller <graham.miller@gmail.com>  
Greg Ward <greg@gerg.ca>  
Guillaume J. Charmes <guillaume@charmes.net>  
Guobiao Mei <meiguobiao@gmail.com>  
Gustav Paul <gustav.paul@gmail.com>  
Gustavo Franco <gustavorfranco@gmail.com>  
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>  
Gwenael Treguier <gwenn.kahz@gmail.com>  
Gyu-Ho Lee <gyuhox@gmail.com>  
H. brahim Gngr <igungor@gmail.com>  
Hajime Hoshi <hajimehoshi@gmail.com>  
Hallgrimur Gunnarsson <halg@google.com>  
Han-Wen Nienhuys <hanwen@google.com>  
Hari haran <hariharan.uno@gmail.com>  
Hariharan Srinath <srinathh@gmail.com>  
Harley Laue <losinggeneration@gmail.com>  
Harry Moreno <morenoh149@gmail.com>  
Harshavardhana <hrshvardhana@gmail.com>  
Hvard Haugen <havard.haugen@gmail.com>  
Hector Chu <hectorchu@gmail.com>  
Hector Martin Cantero <hector@marcansoft.com>  
Henning Schmiedehausen <henning@schmiedehausen.org>  
Henrik Edwards <henrik.edwards@gmail.com>  
Henrik Hodne <henrik@hodne.io>  
Herbert Georg Fischer <herbert.fischer@gmail.com>  
Hironao OTSUBO <motemen@gmail.com>  
Hiroshi Ioka <hirochachacha@gmail.com>

Hitoshi Mitake <mitake.hitoshi@gmail.com>  
Holden Huang <ttyh061@gmail.com>  
Hong Ruiqi <hongruiqi@gmail.com>  
Hossein Sheikh Attar <hattar@google.com>  
Hsin-Ho Yeh <yhh92u@gmail.com>  
Hu Keping <hukeping@huawei.com>  
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>  
Ian Gudger <ian@loosescre.ws>  
Ian Lance Taylor <iant@golang.org>  
Icarus Sparry <golang@icarus.freeuk.com>  
Idora Shinatose <idora.shinatose@gmail.com>  
Igor Bernstein <igorbernstein@google.com>  
Igor Dolzhirov <bluesriverz@gmail.com>  
Ilya Tocar <ilya.tocar@intel.com>  
INADA Naoki <songofacandy@gmail.com>  
Ingo Krabbe <ikrabbe.ask@gmail.com>  
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>  
Irieda Noboru <irieda@gmail.com>  
Isaac Wagner <ibw@isaacwagner.me>  
Ivan Babrou <ivan@cloudflare.com>  
Ivan Krasin <krasin@golang.org>  
Ivan Ukhov <ivan.ukhov@gmail.com>  
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>  
Jack Lindamood <jlindamo@justin.tv>  
Jacob Baskin <jbaskin@google.com>  
Jacob H. Haven <jacob@cloudflare.com>  
Jacob Hoffman-Andrews <github@hoffman-andrews.com>  
Jae Kwon <jae@tendermint.com>  
Jakob Borg <jakob@nym.se>  
Jakub ajka <jcajka@redhat.com>  
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>  
James Aguilar <jaguilar@google.com>  
James Bardin <j.bardin@gmail.com>  
James Chacon <jchacon@google.com>  
James Clarke <jrtc27@jrtc27.com>  
James David Chalfant <james.chalfant@gmail.com>  
James Fysh <james.fysh@gmail.com>  
James Gray <james@james4k.com>  
James Meneghello <rawrz0r@gmail.com>  
James P. Cooper <jamespcooper@gmail.com>  
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>  
James Schofield <james@shooboxapp.com>  
James Sweet <james.sweet88@googlemail.com>  
James Toy <nil@opensesame.st>  
James Tucker <raggi@google.com>  
James Whitehead <jnwhiteh@gmail.com>  
Jamie Beverly <jamie.r.beverly@gmail.com>  
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>



Jamie Turner <jamwt@dropbox.com>  
Jamie Wilkinson <jaq@spacepants.org>  
Jamil Djadala <djadala@gmail.com>  
Jan H. Hosang <jan.hosang@gmail.com>  
Jan Kratochvil <jan.kratochvil@redhat.com>  
Jan Mercl <0xjnml@gmail.com>  
Jan Mercl <befelemepeseveze@gmail.com>  
Jan Newmarch <jan.newmarch@gmail.com>  
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>  
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>  
Jaroslavas Poepko <jp@webmaster.ms>  
Jason Barnett <jason.w.barnett@gmail.com>  
Jason Buberel <jbuberel@google.com>  
Jason Del Ponte <delpontej@gmail.com>  
Jason Hall <jasonhall@google.com>  
Jason Smale <jsmale@zendesk.com>  
Jason Travis <infomaniac7@gmail.com>  
Jay Weisskopf <jay@jayschwa.net>  
Jean-Marc Eurin <jmeurin@google.com>  
Jean-Nicolas Moal <jn.moal@gmail.com>  
Jed Denlea <jed@fastly.com>  
Jeff Craig <jeffcraig@google.com>  
Jeff Hodges <jeff@somethingsimilar.com>  
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>  
Jeff Sickel <jas@corpus-callosum.com>  
Jeff Wendling <jeff@spacemonkey.com>  
Jens Frederich <jfrederich@gmail.com>  
Jeremiah Harmsen <jeremiah@google.com>  
Jeremy Jackins <jeremyjackins@gmail.com>  
Jeremy Schlatter <jeremy.schlatter@gmail.com>  
Jeroen Bobbeldijk <jerbob92@gmail.com>  
Jess Frazelle <me@jessfraz.com>  
Jesse Szwedko <jesse.szwedko@gmail.com>  
Jihyun Yu <yjh0502@gmail.com>  
Jim Cote <jfcote87@gmail.com>  
Jim Kingdon <jim@bolt.me>  
Jim McGrath <jimmc2@gmail.com>  
Jimmy Zelinskie <jimmyzelinskie@gmail.com>  
Jingcheng Zhang <diogin@gmail.com>  
Jingguo Yao <yaojingguo@gmail.com>  
Jiong Du <londevil@gmail.com>  
Jirka Dank <dnk@mail.muni.cz>  
Joakim Sernbrant <serbaut@gmail.com>  
Joe Farrell <joe2farrell@gmail.com>  
Joe Harrison <joehazzers@gmail.com>  
Joe Henke <joed.henke@gmail.com>  
Joe Poirier <jdpoirier@gmail.com>  
Joe Shaw <joe@joeshaw.org>

Joe Sylve <joe.sylve@gmail.com>  
Joe Tsai <joetsai@digital-static.net>  
Joel Sing <jsing@google.com>  
Joel Stemmer <stemmertech@gmail.com>  
Johan Euphrosine <proppy@google.com>  
Johan Sageryd <j@1616.se>  
John Asmuth <jasmuth@gmail.com>  
John Beisley <huin@google.com>  
John C Barstow <jbowtie@amathaine.com>  
John DeNero <denero@google.com>  
John Dethridge <jcd@golang.org>  
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>  
John Howard Palevich <jack.palevich@gmail.com>  
John Jeffery <jjeffery@sp.com.au>  
John Jenkins <twodopeshaggy@gmail.com>  
John Newlin <jnewlin@google.com>  
John Potocny <johnp@vividcortex.com>  
John Schnake <schnake.john@gmail.com>  
John Shahid <jvshahid@gmail.com>  
John Tuley <john@tuley.org>  
Jon Chen <jchen@justin.tv>  
Jonathan Allie <jonallie@google.com>  
Jonathan Amsterdam <jba@google.com>  
Jonathan Boulle <jonathanboulle@gmail.com>  
Jonathan Feinberg <feinberg@google.com>  
Jonathan Gold <jgold.bg@gmail.com>  
Jonathan Hseu <jhseu@google.com>  
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>  
Jonathan Nieder <jrn@google.com>  
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>  
Jonathan Rudenberg <jonathan@titanous.com>  
Jonathan Wills <runningwild@gmail.com>  
Jongmin Kim <atomaths@gmail.com>  
Joonas Kuorilehto <joneskoo@derbian.fi>  
Joop Kieft <ikojba@gmail.com> <joop@kiefte.net>  
Jordan Lewis <jordanthelewis@gmail.com>  
Jos Visser <josv@google.com>  
Jose Luis Vazquez Gonzlez <josvazg@gmail.com>  
Joseph Bonneau <jcb@google.com>  
Joseph Holsten <joseph@josephholsten.com>  
Josh Bleecher Snyder <josharian@gmail.com>  
Josh Chorlton <jchorlton@gmail.com>  
Josh Goebel <dreamer3@gmail.com>  
Josh Hoak <jhoak@google.com>  
Josh Holland <jrh@joshh.co.uk>  
Joshua Boelter <joshua.boelter@intel.com>  
Joshua Chase <jcjosuachase@gmail.com>  
Jostein Stuhaug <js@solidsystem.no>

JP Sugarbrood <jpsugar@google.com>  
JT Olds <jtolds@xnet5.com>  
Jukka-Pekka Kekkonen <karatepekka@gmail.com>  
Julia Hansbrough <flowerhack@google.com>  
Julian Kornberger <jk+github@digineo.de>  
Julian Phillips <julian@quantumfyre.co.uk>  
Julien Schmidt <google@julienschmidt.com>  
Jungho Ahn <jhahn@google.com>  
Jure Ham <jure.ham@zemanta.com>  
Justin Nu <nuss.justin@gmail.com>  
Justyn Temme <justyntemme@gmail.com>  
Kai Backman <kaib@golang.org>  
Kale Blankenship <kale@lemnisis.com>  
Kamal Aboul-Hosn <aboulhosn@google.com>  
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>  
Kang Hu <hukangustc@gmail.com>  
Karan Dhiman <karandhi@ca.ibm.com>  
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>  
Katrina Owen <katrina.owen@gmail.com>  
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>  
Kay Zhu <kayzhu@google.com>  
KB Sriram <kbsriram@google.com>  
Keegan Carruthers-Smith <keegan.csmith@gmail.com>  
Kei Son <hey.calmdown@gmail.com>  
Keith Ball <inflatablewoman@gmail.com>  
Keith Randall <khr@golang.org>  
Keith Rarick <kr@xph.us>  
Kelsey Hightower <kelsey.hightower@gmail.com>  
Kelvin Foo Chuan Lyi <vmirage@gmail.com>  
Ken Friedenbach <kenliz@cruzio.com>  
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>  
Ken Sedgwick <ken@bonsai.com>  
Ken Thompson <ken@golang.org>  
Kenji Kaneda <kenji.kaneda@gmail.com>  
Kenneth Shaw <kenshaw@gmail.com>  
Kenny Grant <kennygrant@gmail.com>  
Kevin Ballard <kevin@sb.org>  
Kevin Burke <kev@inburke.com>  
Kevin Kirsche <kev.kirsche@gmail.com>  
Kevin Klues <klueska@gmail.com> <klueska@google.com>  
Kevin Malachowski <chowski@google.com>  
Kevin Vu <kevin.m.vu@gmail.com>  
Kim Shrier <kshrier@racktopsystems.com>  
Kirklin McDonald <kirklin.mcdonald@gmail.com>  
Klaus Post <klauspost@gmail.com>  
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>  
Kris Rousey <krousey@google.com>  
Kristopher Watts <traetox@gmail.com>

Kun Li <likunarmstrong@gmail.com>  
Kyle Consalus <consalus@gmail.com>  
Kyle Isom <kyle@gokyle.net>  
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>  
L Campbell <unpansu@gmail.com>  
Lai Jiangshan <eag0628@gmail.com>  
Larry Hosken <lahosken@golang.org>  
Larz Conwell <larzconwell@gmail.com>  
LE Manh Cuong <cuong.manhle.vn@gmail.com>  
Lee Hinman <hinman@gmail.com>  
Lee Packham <lpackham@gmail.com>  
Lewin Bormann <lewin.bormann@gmail.com>  
Lloyd Dewolf <foolswisdom@gmail.com>  
Lorenzo Stoakes <lstoakes@gmail.com>  
Louis Kruger <louisk@google.com>  
Luan Santos <cfcluan@gmail.com>  
Luca Greco <luca.greco@alcacoop.it>  
Lucien Stuker <lucien.stuker@gmail.com>  
Lucio De Re <lucio.dere@gmail.com>  
Luigi Riefolo <luigi.riefolo@gmail.com>  
Luit van Drongelen <luitvd@gmail.com>  
Luka Zakrajek <tr00.g33k@gmail.com>  
Luke Curley <qpingu@gmail.com>  
Luna Duclos <luna.duclos@palmstonegames.com>  
Luuk van Dijk <lvd@golang.org> <lvd@google.com>  
Lynn Boger <laboger@linux.vnet.ibm.com>  
Maksym Trykur <maksym.trykur@gmail.com>  
Mal Curtis <mal@mal.co.nz>  
Manfred Touron <m@42.am>  
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>  
Manu Garg <manugarg@google.com>  
Manu S Ajith <neo@codingarena.in>  
Manuel Mendez <mmendez534@gmail.com>  
Marc Weistroff <marc@weistroff.net>  
Marc-Antoine Ruel <maruel@chromium.org>  
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>  
Marcel van Lohuizen <mpvl@golang.org>  
Marco Hennings <marco.hennings@freiheit.com>  
Marga Manterola <marga@google.com>  
Marin Bai <marin.basic02@gmail.com>  
Marius Nuennerich <mnu@google.com>  
Mark Bucciarelli <mkbucc@gmail.com>  
Mark Severson <miquella@gmail.com>  
Mark Theunissen <mark.theunissen@gmail.com>  
Mark Zavislak <zavislak@google.com>  
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>  
Marko Mikulicic <mkm@google.com>  
Marko Tiikkaja <marko@joh.to>

Markus Duft <markus.duft@salomon.at>  
Markus Sonderegger <marraison@gmail.com>  
Markus Zimmermann <zimmski@gmail.com>  
Martin Bertschler <mbertschler@gmail.com>  
Martin Garton <garton@gmail.com>  
Martin Hamrle <martin.hamrle@gmail.com>  
Martin Kreichgauer <martinkr@google.com>  
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>  
Martin Neubauer <m.ne@gmx.net>  
Martin Olsson <martin@minimum.se>  
Marvin Stenger <marvin.stenger94@gmail.com>  
Mateusz Czapliski <czapkofan@gmail.com>  
Mathias Beke <git@denbeke.be>  
Mathias Leppich <mleppich@muhqu.de>  
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>  
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>  
Matt Aimonetti <mattaimonetti@gmail.com>  
Matt Bostock <matt@mattbostock.com>  
Matt Brown <mdbrown@google.com>  
Matt Drollette <matt@drollette.com>  
Matt Jibson <matt.jibson@gmail.com>  
Matt Joiner <anacrolix@gmail.com>  
Matt Jones <mrjones@google.com>  
Matt Layher <mdllyher@gmail.com>  
Matt Reiferson <mreiferson@gmail.com>  
Matt Robenolt <matt@ydekproductions.com>  
Matt T. Proud <matt.proud@gmail.com>  
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>  
Matthew Brennan <matty.brennan@gmail.com>  
Matthew Cottingham <mattcottingham@gmail.com>  
Matthew Dempsky <mdempsky@google.com>  
Matthew Denton <mdenton@skyportsystems.com>  
Matthew Holt <Matthew.Holt+git@gmail.com>  
Matthew Horsnell <matthew.horsnell@gmail.com>  
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>  
Matthieu Olivier <olivier.matthieu@gmail.com>  
Max Riveiro <kavu13@gmail.com>  
Maxim Khitrov <max@mxcrypt.com>  
Maxim Pimenov <mpimenov@google.com>  
Maxim Ushakov <ushakov@google.com>  
Maxwell Krohn <themax@gmail.com>  
Meir Fischer <meirfischer@gmail.com>  
Meng Zhuo <mengzhuo1203@gmail.com>  
Mhd Sulhan <m.shulhan@gmail.com>  
Micah Stetson <micah.stetson@gmail.com>  
Michael Chaten <mchaten@gmail.com>  
Michael Darakananda <pongad@google.com>  
Michael Elkins <michael.elkins@gmail.com>

Michael Fraenkel <michael.fraenkel@gmail.com>  
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>  
Michael Hoisie <hoisie@gmail.com>  
Michael Hudson-Doyle <michael.hudson@linaro.org>  
Michael Kufel <golang@c.michael-kaeufl.de>  
Michael Kelly <mjk@google.com>  
Michael Lewis <mikelikespie@gmail.com>  
Michael MacInnis <Michael.P.MacInnis@gmail.com>  
Michael Marineau <michael.marineau@coreos.com>  
Michael Matloob <matloob@google.com>  
Michael McConville <momconville@gmail.com>  
Michael McGreevy <mcgreevy@golang.org>  
Michael Munday <munday@ca.ibm.com>  
Michael Pearson <mipearson@gmail.com>  
Michael Piatek <piatek@google.com>  
Michael Pratt <mpratt@google.com>  
Michael Schaller <michael@5challer.de>  
Michael Shields <mshields@google.com>  
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>  
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>  
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>  
Michael Vetter <g.bluehut@gmail.com>  
Michal Bohuslvek <mbohuslvek@gmail.com>  
Michal Cierniak <cierniak@google.com>  
Micha Derkacz <ziutek@inet.pl>  
Michalis Kargakis <michaliskargakis@gmail.com>  
Michel Lespinasse <>walken@google.com>  
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>  
Miguel Mendez <stxmendez@gmail.com>  
Mihai Borobocea <MihaiBorobocea@gmail.com>  
Mikael Tillenius <mikti42@gmail.com>  
Mike Andrews <mra@xoba.com>  
Mike Appleby <mike@app.leby.org>  
Mike Danese <mikedanese@google.com>  
Mike Houston <mike@kothar.net>  
Mike Rosset <mike.rosset@gmail.com>  
Mike Samuel <mikesamuel@gmail.com>  
Mike Solomon <msolo@gmail.com>  
Mike Strosaker <strosake@us.ibm.com>  
Mikhail Gusarov <dottedmag@dottedmag.net>  
Mikhail Panchenko <m@mihasya.com>  
Miki Tebeka <miki.tebeka@gmail.com>  
Mikio Hara <mikioh.mikioh@gmail.com>  
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>  
Miquel Sabat Sol <mikisabate@gmail.com>  
Miroslav Genov <mgenov@gmail.com>  
Mohit Agarwal <mohit@sdf.org>  
Momchil Velikov <momchil.velikov@gmail.com>

Monty Taylor <mordred@inaugust.com>  
Moriyoshi Koizumi <mozo@mozo.jp>  
Morten Siebuhr <sbhr@sbhr.dk>  
Mshe van der Sterre <moshevds@gmail.com>  
Mrunal Patel <mrunalp@gmail.com>  
Muhammed Uluyol <uluyol0@gmail.com>  
Nan Deng <monnand@gmail.com>  
Nathan John Youngman <nj@nathany.com>  
Nathan Otterness <otternes@cs.unc.edu>  
Nathan P Finch <nate.finch@gmail.com>  
Nathan VanBenschoten <nvanbenschoten@gmail.com>  
Nathan Youngman <git@nathany.com>  
Nathan(yinian) Hu <nathanhu@google.com>  
Neelesh Chandola <neelesh.c98@gmail.com>  
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>  
Niall Sheridan <nsheridan@gmail.com>  
Nic Day <nic.day@me.com>  
Nicholas Katsaros <nick@nickkatsaros.com>  
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>  
Nicholas Sullivan <nicholas.sullivan@gmail.com>  
Nicholas Waples <nwaples@gmail.com>  
Nick Cooper <nmvc@google.com>  
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>  
Nick Harper <nharper@google.com>  
Nick Leli <nicholasleli@gmail.com>  
Nick Patavalis <nick.patavalis@gmail.com>  
Nick Petroni <npetroni@cs.umd.edu>  
Nicolas Kaiser <nikai@nikai.net>  
Nicolas Owens <mischief@offblast.org>  
Nicolas S. Dade <nic.dade@gmail.com>  
Niels Widger <niels.widger@gmail.com>  
Nigel Kerr <nigel.kerr@gmail.com>  
Nigel Tao <nigeltao@golang.org>  
Nik Nyby <nnyby@columbia.edu>  
Niko Dziemba <niko@dziemba.com>  
Nikolay Turpitko <nikolay@turpitko.com>  
Noah Campbell <noahcampbell@gmail.com>  
Nodir Turakulov <nodir@google.com>  
Norberto Lopes <nlopes.ml@gmail.com>  
Odin Ugedal <odin@ugedal.com>  
Oleg Vakheta <helginet@gmail.com>  
Oleku Konko <oleku.konko@gmail.com>  
Oling Cat <olingcat@gmail.com>  
Oliver Hookins <ohookins@gmail.com>  
Olivier Antoine <olivier.antoine@gmail.com>  
Olivier Duperray <duperray.olivier@gmail.com>  
Olivier Poitrey <rs@dailymotion.com>  
Olivier Saingre <osaingre@gmail.com>

Omar Jarjur <ojarjur@google.com>  
zgr Kesim <oec-go@kesim.org>  
Padraig Kitterick <padraigkitterick@gmail.com>  
Paolo Giarrusso <p.giarrusso@gmail.com>  
Paolo Martini <mrtnpaolo@gmail.com>  
Parker Moore <parkrmoore@gmail.com>  
Pascal S. de Kloe <pascal@quies.net>  
Patrick Crosby <patrick@stathat.com>  
Patrick Gavlin <pgavlin@gmail.com>  
Patrick Higgins <patrick.allen.higgins@gmail.com>  
Patrick Lee <pattyshack101@gmail.com>  
Patrick Mzard <patrick@mezard.eu>  
Patrick Mylund Nielsen <patrick@patrickmn.com>  
Patrick Riley <pfr@google.com>  
Patrick Smith <pat42smith@gmail.com>  
Paul A Querna <paul.querna@gmail.com>  
Paul Borman <borman@google.com>  
Paul Chang <paulchang@google.com>  
Paul Hammond <paul@paulhammond.org>  
Paul Hankin <paulhankin@google.com>  
Paul Lalonde <paul.a.lalonde@gmail.com>  
Paul Marks <pmarks@google.com>  
Paul Meyer <paul.meyer@microsoft.com>  
Paul Nasrat <pnasrat@google.com>  
Paul Rosania <paul.rosania@gmail.com>  
Paul Sbarra <Sbarra.Paul@gmail.com>  
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>  
Paul van Brouwershaven <paul@vanbrouwershaven.com>  
Paul Wankadia <junyer@google.com>  
Paulo Casaretto <pcasaretto@gmail.com>  
Pavel Paulau <pavel.paulau@gmail.com>  
Pavel Zinovkin <pavel.zinovkin@gmail.com>  
Pawel Knap <pawelknap88@gmail.com>  
Pawel Szczur <filemon@google.com>  
Percy Wegmann <ox.to.a.cart@gmail.com>  
Perry Abbott <perry.j.abbott@gmail.com>  
Petar Maymoukov <petarm@gmail.com>  
Peter Armitage <peter.armitage@gmail.com>  
Peter Collingbourne <pcc@google.com>  
Peter Froehlich <peter.hans.froehlich@gmail.com>  
Peter Gonda <pgonda@google.com>  
Peter Kleiweg <pkleiweg@xs4all.nl>  
Peter McKenzie <petermck@google.com>  
Peter Moody <pmoody@uber.com>  
Peter Mundy <go.peter.90@gmail.com>  
Pter Surnyi <speter.go1@gmail.com>  
Pter Szab <pts@google.com>  
Pter Szilgyi <peterke@gmail.com>



Peter Tseng <ptseng@squareup.com>  
Peter Waldschmidt <peter@waldschmidt.com>  
Peter Waller <peter.waller@gmail.com>  
Peter Weinberger <pjw@golang.org>  
Peter Williams <pwil3058@gmail.com>  
Phil Pennock <pdp@golang.org>  
Philip Brgesen <philip.brgesen@gmail.com>  
Philip Hofer <phofer@umich.edu>  
Philip K. Warren <pkwarren@gmail.com>  
Pierre Durand <pierredurand@gmail.com>  
Pierre Roullon <pierre.roullon@gmail.com>  
Pieter Droogendijk <pieter@binky.org.uk>  
Pietro Gagliardi <pietro10@mac.com>  
Prasanna Swaminathan <prasanna@mediamath.com>  
Prashant Varanasi <prashant@prashantv.com>  
Preetam Jinka <pj@preet.am>  
Quan Tran <qeed.quan@gmail.com>  
Quan Yong Zhai <qyzhai@gmail.com>  
Quentin Perez <qperez@ocs.online.net>  
Quentin Smith <quentin@golang.org>  
Quinn Slack <sq@sourcegraph.com>  
Quoc-Viet Nguyen <afelion@gmail.com>  
Radu Berinde <radu@cockroachlabs.com>  
Rafal Jeczalik <rjeczalik@gmail.com>  
Rahul Chaudhry <rahulchaudhry@chromium.org>  
Raif S. Naffah <go@naffah-raif.name>  
Rajat Goel <rajat.goel2010@gmail.com>  
Ralph Corderoy <ralph@inputplus.co.uk>  
Ramesh Dharan <dharan@google.com>  
Raph Levien <raph@google.com>  
Raphael Geronimi <raphael.geronimi@gmail.com>  
Raul Silvera <rsilvera@google.com>  
Rebecca Stambler <rstambler@golang.org>  
Reinaldo de Souza Jr <juniorz@gmail.com>  
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>  
Rhys Hiltner <rhys@justin.tv>  
Ricardo Padilha <ricardospadilha@gmail.com>  
Richard Barnes <rlb@ipv.sx>  
Richard Crowley <r@rcrowley.org>  
Richard Eric Gavaletz <gavaletz@gmail.com>  
Richard Gibson <richard.gibson@gmail.com>  
Richard Miller <miller.research@gmail.com>  
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>  
Rick Arnold <rickarnoldjr@gmail.com>  
Rick Hudson <rlh@golang.org>  
Riku Voipio <riku.voipio@linaro.org>  
Risto Jaakko Saarelm <rsaarelm@gmail.com>  
Rob Earhart <earhart@google.com>

Rob Norman <rob.norman@infinitycloud.com>  
Rob Pike <r@golang.org>  
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au>  
Robert Dinu <r@varp.se>  
Robert Figueiredo <robfig@gmail.com>  
Robert Griesemer <gri@golang.org>  
Robert Hencke <robert.hencke@gmail.com>  
Robert Iannucci <iannucci@google.com>  
Robert Obryk <robryk@gmail.com>  
Robert Seseek <rseseek@google.com>  
Robert Snedegar <roberts@google.com>  
Robert Stepanek <robert.stepanek@gmail.com>  
Robin Eklind <r.eklind.87@gmail.com>  
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>  
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>  
Roger Pau Monn <royger@gmail.com>  
Roger Peppe <rogpeppe@gmail.com>  
Roland Shoemaker <rolandshoemaker@gmail.com>  
Ron Hashimoto <mail@h2so5.net>  
Ron Minnich <rminnich@gmail.com>  
Ross Light <light@google.com> <rlight2@gmail.com>  
Rowan Worth <sqweek@gmail.com>  
Rui Ueyama <ruiiu@google.com>  
Russ Cox <rsc@golang.org>  
Russell Haering <russellhaering@gmail.com>  
Ryan Bagwell <ryanbagwell@outlook.com>  
Ryan Barrett <ryanb@google.com>  
Ryan Brown <ribrd@b@google.com>  
Ryan Hitchman <hitchmanr@gmail.com>  
Ryan Lower <rpjlower@gmail.com>  
Ryan Seys <ryan@ryanseys.com>  
Ryan Slade <ryanslade@gmail.com>  
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>  
S.alar Onur <caglar@10ur.org>  
Sai Cheemalapati <saicheems@google.com>  
Salmn Aljammz <s@0x65.net>  
Sam Ding <samding@ca.ibm.com>  
Sam Hug <samuel.b.hug@gmail.com>  
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>  
Sam Whited <sam@samwhited.com>  
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>  
Sami Commerot <samic@google.com>  
Samuel Tan <samueltan@google.com>  
Samuele Pedroni <pedronis@lucediaruna.net>  
Sanjay Menakuru <balasanjay@gmail.com>  
Sarah Adams <shadams@google.com>  
Sasha Lionheart <lionhearts@google.com>  
Sasha Sobol <sasha@scaledinference.com>

Scott Barron <scott.barron@github.com>  
Scott Bell <scott@sctsm.com>  
Scott Ferguson <scottwferg@gmail.com>  
Scott Lawrence <bytbody@gmail.com>  
Scott Mansfield <smansfield@netflix.com>  
Scott Schwartz <scotts@golang.org>  
Scott Van Woudenberg <scottvw@google.com>  
Sean Burford <sburford@google.com>  
Sean Dolphin <Sean.Dolphin@kpcompass.com>  
Sean Harger <sharger@google.com>  
Sean Rees <sean@erifax.org>  
Sebastien Binet <seb.binet@gmail.com>  
Sbastien Paolacci <sebastien.paolacci@gmail.com>  
Sergei Skorobogatov <skorobo@rambler.ru>  
Sergey 'Snake' Gromov <snake.scaly@gmail.com>  
Sergey Arseev <sergey.arseev@intel.com>  
Sergio Luis O. B. Correia <sergio@correia.cc>  
Seth Hoenig <seth.a.hoenig@gmail.com>  
Seth Vargo <sethvargo@gmail.com>  
Shahar Kohanim <skohanim@gmail.com>  
Shane Hansen <shanemhansen@gmail.com>  
Shaozhen Ding <dsz0111@gmail.com>  
Shawn Ledbetter <sledbetter@google.com>  
Shawn Smith <shawn.p.smith@gmail.com>  
Shawn Walker-Salas <shawn.walker@oracle.com>  
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>  
Shinji Tanaka <shinji.tanaka@gmail.com>  
Shivakumar GN <shivakumar.gn@gmail.com>  
Shun Fan <sfan@google.com>  
Silvan Jegen <s.jegen@gmail.com>  
Simon Jefford <simon.jefford@gmail.com>  
Simon Rawet <simon@rawet.se>  
Simon Thulbourn <simon+github@thulbourn.com>  
Simon Whitehead <chemnova@gmail.com>  
Sina Siadat <siadat@gmail.com>  
Sokolov Yura <funny.falcon@gmail.com>  
Song Gao <song@gao.io>  
Spencer Nelson <s@spenczar.com>  
Spring Mc <heresy.mc@gmail.com>  
Srdjan Petrovic <spetrovic@google.com>  
Sridhar Venkatakrishnan <sridhar@laddoo.net>  
StalkR <stalkr@stalkr.net>  
Stan Schwertly <stan@schwertly.com>  
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>  
Stphane Travostino <stephane.travostino@gmail.com>  
Stephen Ma <stephenm@golang.org>  
Stephen McQuay <stephen@mcquay.me>  
Stephen Weinberg <stephen@q5comm.com>

Steve Francia <spf@golang.org>  
Steve McCoy <mccoyst@gmail.com>  
Steve Newman <snewman@google.com>  
Steve Phillips <elimistev@gmail.com>  
Steve Streeting <steve@stevestreeting.com>  
Steven Elliot Harris <seharris@gmail.com>  
Steven Hartland <steven.hartland@multiplay.co.uk>  
Sugu Sougoumarane <ssougou@gmail.com>  
Suharsh Sivakumar <suharshs@google.com>  
Suyash <dextrous93@gmail.com>  
Sven Almgren <sven@tras.se>  
Sven Blumenstein <svbl@google.com>  
Syohei YOSHIDA <syohex@gmail.com>  
Szabolcs Nagy <nsz@port70.net>  
Tad Glines <tad.glines@gmail.com>  
Taj Khattrra <taj.khattrra@gmail.com>  
Takashi Matsuo <tmatsuo@google.com>  
Takeshi YAMANASHI <9.nashi@gmail.com>  
Takuya Ueda <uedatakuya@gmail.com>  
Tal Shprecher <tshprecher@gmail.com>  
Tamir Duberstein <tamird@gmail.com>  
Tarmigan Casebolt <tarmigan@gmail.com>  
Taru Karttunen <taruti@taruti.net>  
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>  
Terrel Shumway <gopher@shumway.us>  
Tetsuo Kiso <tetsuokiso9@gmail.com>  
Than McIntosh <thanm@google.com>  
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>  
Thomas Alan Copeland <talán.copeland@gmail.com>  
Thomas de Zeeuw <thomasdezeeuw@gmail.com>  
Thomas Desrosiers <thomasdesr@gmail.com>  
Thomas Habets <habets@google.com>  
Thomas Kappler <tkappler@gmail.com>  
Thorben Krueger <thorben.krueger@gmail.com>  
Thordur Bjornsson <thorduri@secnorth.net>  
Tilman Dilo <tilman.dilo@gmail.com>  
Tim Cooijmans <timcooijmans@gmail.com>  
Tim Ebringer <tim.ebringer@gmail.com>  
Tim Henderson <tim.tadh@gmail.com>  
Tim Hockin <thockin@google.com>  
Tim Swast <swast@google.com>  
Timo Savola <timo.savola@gmail.com>  
Timo Truys <alkaloid.btx@gmail.com>  
Timothy Studd <tim@timstudd.com>  
Tipp Moseley <tipp@google.com>  
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>  
Toby Burrell <kurin@google.com>  
Todd Neal <todd@tneal.org>

Todd Wang <toddwang@gmail.com>  
Tom Bergan <tombergan@google.com>  
Tom Heng <zhm20070928@gmail.com>  
Tom Linfoord <tomlinfoord@gmail.com>  
Tom Szymanski <tgs@google.com>  
Tom Wilkie <tom@weave.works>  
Tommy Schaefer <tommy.schaefer@teecom.com>  
Tor Andersson <tor.andersson@gmail.com>  
Tormod Erevik Lea <tormodlea@gmail.com>  
Totoro W <tw19881113@gmail.com>  
Travis Cline <travis.cline@gmail.com>  
Trevor Strohman <trevor.strohman@gmail.com>  
Trey Lawrence <lawrence.trey@gmail.com>  
Trey Tacon <ttacon@gmail.com>  
Tristan Amini <tamini01@ca.ibm.com>  
Tristan Colgate <tcolgate@gmail.com>  
Tristan Oohry <ooohry@gmail.com>  
Tudor Golubenco <tudor.g@gmail.com>  
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>  
Tyler Bunnell <tylerbunnell@gmail.com>  
Tyler Treat <ttreat31@gmail.com>  
Tzu-Jung Lee <roylee17@currant.com>  
Ugorji Nwoke <ugorji@gmail.com>  
Ulf Holm Nielsen <doktor@dyregod.dk>  
Ulrich Kunitz <uli.kunitz@gmail.com>  
Uriel Mangado <uriel@berlinblue.org>  
Uttam C Pawar <uttam.c.pawar@intel.com>  
Vadim Grek <vadimprog@gmail.com>  
Vadim Vygonets <unixdj@gmail.com>  
Vega Garcia Luis Alfonso <vegacom@gmail.com>  
Victor Chudnovsky <vchudnov@google.com>  
Vincent Ambo <tazjin@googlemail.com>  
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>  
Vincent Vanackere <vincent.vanackere@gmail.com>  
Vinu Rajashekhar <vinutheraj@gmail.com>  
Vish Subramanian <vish@google.com>  
Vishvananda Ishaya <vishvananda@gmail.com>  
Vitor De Mario <vitordemario@gmail.com>  
Vlad Krasnov <vlad@cloudflare.com>  
Vladimir Mihailenco <vladimir.webdev@gmail.com>  
Vladimir Nikishenko <vova616@gmail.com>  
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>  
Volker Dobler <dr.volker.dobler@gmail.com>  
Volodymyr Paprotsky <vpaprots@ca.ibm.com>  
Walter Poupore <wpoupore@google.com>  
Wedson Almeida Filho <wedsonaf@google.com>  
Wei Guangjing <vcc.163@gmail.com>  
Will Chan <willchan@google.com>

Will Norris <willnorris@google.com>  
Willem van der Schyff <willemvds@gmail.com>  
William Chan <willchan@chromium.org>  
William Josephson <wjosephson@gmail.com>  
William Orr <will@worrbase.com> <ay1244@gmail.com>  
Wisdom Omuya <deafgoat@gmail.com>  
Xia Bin <snyh@snyh.org>  
Xing Xing <mikespook@gmail.com>  
Xudong Zhang <felixmelon@gmail.com>  
Xuyang Kang <xuyangkang@gmail.com>  
Yan Zou <yzou@google.com>  
Yann Kerherv <yann.kerherve@gmail.com>  
Yao Zhang <lunaria21@gmail.com>  
Yasuharu Goto <matope.ono@gmail.com>  
Yasuhiro Matsumoto <mattn.jp@gmail.com>  
Yesudeep Mangalapilly <yesudeep@google.com>  
Yissakhar Z. Beck <yissakhar.beck@gmail.com>  
Yo-An Lin <yoanlin93@gmail.com>  
Yongjian Xu <i3dmaster@gmail.com>  
Yorman Arias <cixtords@gmail.com>  
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>  
Yu Heng Zhang <annita.zhang@cn.ibm.com>  
Yu Xuan Zhang <zyxsh@cn.ibm.com>  
Yuki Yugui Sonoda <yugui@google.com>  
Yusuke Kagiwada <block.rxckin.beats@gmail.com>  
Yuusei Kuwana <kuwana@kumama.org>  
Yuval Pavel Zholkover <paulzhol@gmail.com>  
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>  
Zac Bergquist <zbergquist99@gmail.com>  
Zev Goldstein <zev.goldstein@gmail.com>  
Zhongwei Yao <zhongwei.yao@arm.com>  
Ziad Hatahet <hatahet@gmail.com>  
Zorion Arrizabalaga <zorionk@gmail.com>  
<faxriddinjon@gmail.com>  
<bronze1man@gmail.com>  
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- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollDomainSocketChannelConfig.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollChannelConfig.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollEventArray.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollServerDomainSocketChannel.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollMode.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/TcpMd5Util.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollRecvByteAllocatorStreamingHandle.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/AbstractEpollServerChannel.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollServerChannelConfig.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollRecvByteAllocatorHandle.java
- \* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollDomainSocketChannel.java

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 * Allowing them being read would mean anyone with access to the channel could get them.
 */
```

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```
*/
/**
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 * Keys can only be set on, not read to prevent a potential leak, as they are confidential.
 * Allowing them being read would mean anyone with access to the channel could get them.
 */
/**
 * Set the { @code TCP_QUICKACK } option on the socket. See TCP_QUICKACK
 * for more details.
 */
```

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* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
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jar/io/netty/channel/epoll/NativeDatagramPacketArray.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollDatagramChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/Epoll.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/package-info.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollServerSocketChannel.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollEventLoop.java
* /opt/ws_local/PERMITS_SQL/1075084041_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-
jar/io/netty/channel/epoll/EpollEventLoopGroup.java
```

\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollChannelOption.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/AbstractEpollChannel.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollSocketChannel.java  
\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/EpollTcpInfo.java

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\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/netty\_epoll\_native.c

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\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/netty\_epoll\_linuxsocket.h

\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/LinuxSocket.java

\* /opt/ws\_local/PERMITS\_SQL/1075084041\_1596044813.39/0/netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/NativeStaticallyReferencedJniMethods.java

## 1.107 react-zoom-pan-pinch 1.6.1

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The primary ANTLR guy:

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parrt@cs.usfca.edu  
parrt@antlr.org

## 1.110 kubernetes-apimachinery 1.8.11

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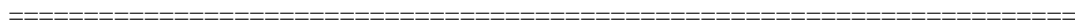
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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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procds provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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17. [18]Torsten Duwe <duwe@immd4.informatik.uni-erlangen.de> Linux port
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19. [20]John Hay <jhay@icomtek.csir.co.za> IPv6 support and testing
20. [21]Dave Hart <davehart@davehart.com> General maintenance, Windows port interpolation rewrite
21. [22]Claas Hilbrecht <neoclock4x@linum.com> NeoClock4X clock driver
22. [23]Glenn Hollinger <glenn@herald.usask.ca> GOES clock driver
23. [24]Mike Iglesias <iglesias@uci.edu> DEC Alpha port
24. [25]Jim Jagielski <jim@jagubox.gsfc.nasa.gov> A/UX port
25. [26]Jeff Johnson <jbj@chatham.usdesign.com> massive prototyping overhaul
26. [27]Hans Lambermont <Hans.Lambermont@nl.origin-it.com> or [28]<H.Lambermont@chello.nl> ntpsweep
27. [29]Poul-Henning Kamp <phk@FreeBSD.ORG> Oncore driver (Original

- author)
28. [30]Frank Kardel [31]<kardel (at) ntp (dot) org> PARSE <GENERIC> (driver 14 reference clocks), STREAMS modules for PARSE, support scripts, syslog cleanup, dynamic interface handling
  29. [32]Johannes Maximilian Kuehn <kuehn@ntp.org> Rewrote sntp to comply with NTPv4 specification, ntpq saveconfig
  30. [33]William L. Jones <jones@hermes.chpc.utexas.edu> RS/6000 AIX modifications, HPUX modifications
  31. [34]Dave Katz <dkatz@cisco.com> RS/6000 AIX port
  32. [35]Craig Leres <leres@ee.lbl.gov> 4.4BSD port, ppsclock, Magnavox GPS clock driver
  33. [36]George Lindholm <lindholm@ucs.ubc.ca> SunOS 5.1 port
  34. [37]Louis A. Mamakos <louie@ni.umd.edu> MD5-based authentication
  35. [38]Lars H. Mathiesen <thorinn@diku.dk> adaptation of foundation code for Version 3 as specified in RFC-1305
  36. [39]Danny Mayer <mayer@ntp.org>Network I/O, Windows Port, Code Maintenance
  37. [40]David L. Mills <mills@udel.edu> Version 4 foundation, precision kernel; clock drivers: 1, 3, 4, 6, 7, 11, 13, 18, 19, 22, 36
  38. [41]Wolfgang Moeller <moeller@gwdgv1.dnet.gwdg.de> VMS port
  39. [42]Jeffrey Mogul <mogul@pa.dec.com> ntptime utility
  40. [43]Tom Moore <tmoore@fieval.daytonoh.ncr.com> i386 svr4 port
  41. [44]Kamal A Mostafa <kamal@whence.com> SCO OpenServer port
  42. [45]Derek Mulcahy <derek@toybox.demon.co.uk> and [46]Damon Hart-Davis <d@hd.org> ARCRON MSF clock driver
  43. [47]Rob Neal <neal@ntp.org> Bancomm refclock and config/parse code maintenance
  44. [48]Rainer Pruy <Rainer.Pruy@informatik.uni-erlangen.de> monitoring/trap scripts, statistics file handling
  45. [49]Dirce Richards <dirce@zk3.dec.com> Digital UNIX V4.0 port
  46. [50]Wilfredo Sanchez <wsanchez@apple.com> added support for NetInfo
  47. [51]Nick Sayer <mrapple@quack.kfu.com> SunOS streams modules
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  49. [53]Ray Schnitzler <schnitz@unipress.com> Unixware1 port
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## References

1. mailto:%20takao\_abe@xurb.jp
2. mailto:%20mark\_andrews@isc.org
3. mailto:%20altmeier@atsoft.de
4. mailto:%20vbais@mailman1.intel.co
5. mailto:%20kirkwood@striderfm.intel.com
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42. mailto:%20mogul@pa.dec.com

43. mailto:%20moore@fieval.daytonoh.ncr.com
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59. mailto:%20tsuruoka@nc.fukuoka-u.ac.jp
60. mailto:%20brian.utterback@oracle.com
61. mailto:%20loganaden@gmail.com
62. mailto:%20vixie@vix.com
63. mailto:%20Ulrich.Windl@rz.uni-regensburg.de

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```

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```
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```

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# 1.114 acpid 2.0.27

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/\* zlib.h -- interface of the 'zlib' general purpose compression library  
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Mesa 3-D graphics library

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include/GL/glxext.h
include/GL/wglxext.h :
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# 1.129 netty 4.1.51.Final

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```
/* zlib.h -- interface of the 'zlib' general purpose compression library
 version 1.2.11, January 15th, 2017
```

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Jean-loup Gailly      Mark Adler  
jloup@gzip.org      madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://tools.ietf.org/html/rfc1950> (zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).

\*/

## 1.131 jackson-dataformat-yaml 2.11.2

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```
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```

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# 1.132 spring-expression 5.2.8.RELEASE

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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-

jar/org/springframework/expression/spel/CompilablePropertyAccessor.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/standard/SpelExpressionParser.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/SpelCompilerMode.java  
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* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/ReflectionHelper.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/StandardTypeConverter.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/DataBindingMethodResolver.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/StandardOperatorOverloader.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/SpelEvaluationException.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/common/CompositeStringExpression.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/common/LiteralExpression.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/SimpleEvaluationContext.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/ExpressionException.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/DataBindingPropertyAccessor.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/ast/FormatHelper.java
* /opt/cola/permits/1135888237_1613626355.04/0/spring-expression-5-2-8-release-sources-1-
jar/org/springframework/expression/spel/support/StandardEvaluationContext.java
```



\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/Operation.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/common/TemplateAwareExpressionParser.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/BeanResolver.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/CodeFlow.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ExpressionState.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/AstUtils.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelMessage.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/ReflectiveMethodResolver.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/BooleanTypedValue.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/standard/SpelCompiler.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/TypedValue.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/EvaluationContext.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/ReflectiveMethodExecutor.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelNode.java

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jar/org/springframework/expression/MethodExecutor.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/MethodResolver.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/ConstructorExecutor.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/common/TemplateParserContext.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/ExpressionInvocationTargetException.java  
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jar/org/springframework/expression/spel/InternalParseException.java  
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- \* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/MethodFilter.java
- \* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/EvaluationException.java
- \* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ConstructorResolver.java
- \* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/standard/TokenKind.java

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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/ReflectiveConstructorExecutor.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/AccessException.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/common/ExpressionUtils.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/Expression.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/TypeConverter.java

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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/TypeComparator.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/OperatorOverloader.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/support/StandardTypeLocator.java

\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ParseException.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/SpelParserConfiguration.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/ParserContext.java  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/OpMinus.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/OperatorNot.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/Elvis.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/CompoundExpression.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-jar/org/springframework/expression/spel/ast/Assign.java  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/OpDec.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/OpGT.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/NullLiteral.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/OpDivide.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/Literal.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/LongLiteral.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/Selection.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/SpelNodeImpl.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/ConstructorReference.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/Indexer.java  
\* /opt/cola/permits/1135888237\_1613626355.04/0/spring-expression-5-2-8-release-sources-1-  
jar/org/springframework/expression/spel/ast/Operator.java

# 1.133 libvpx 1.4.0

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Authors: Loren Merritt <lorenm@u.washington.edu>

Anton Mitrofanov <BugMaster@narod.ru>

Jason Garrett-Glaser <darkshikari@gmail.com>

Henrik Gramner <hengar-6@student.ltu.se>

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Peter Kaminski <piotr@google.com>  
Preston Jackson <preston.a.jackson@gmail.com>  
Rainer Klaffenboeck <rainer.klaffenboeck@dynatrace.com>  
Russ Cox <rsc@google.com>  
Russ Rufer <russ@pentad.com>  
Sean McAfee <eefacm@gmail.com>  
Sigurur sgeirsson <siggi@google.com>  
Tracy Bialik <tracy@pentad.com>  
Vadim Berman <vadimb@google.com>  
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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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The original code is FirewallControl.pas, released April 16, 2007.

The initial developer of the original code is Rainer Budde (<http://www.speed-soft.de>).

SimpleFC - NSIS Firewall Plugin is written, published and maintained by Rainer Budde ([rainer@speed-soft.de](mailto:rainer@speed-soft.de)).

## 1.140 bridgeutils 1.5

## 1.140.1 Available under license :

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Version 2, June 1991

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```

```
<signature of Ty Coon>, 1 April 1989
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 */
```

Found in path(s):

```
*/opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/debug/SecurityDebugBeanFactoryPostProcessor.java
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 */
```

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- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/X509Dsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/session/SessionConcurrencyDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/OAuth2ClientBeanDefinitionParser.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/ServerHttpSecurity.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/FrameOptionsDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ReferrerPolicyDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/XssProtectionConfigDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/PortMapperDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/FormLoginDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AuthorizeRequestsDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/CsrfDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/JwtDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/AuthenticationConfigBuilder.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/RequestCacheDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/OAuth2LoginBeanDefinitionParser.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/SecurityMarker.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/OpaqueTokenDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/HttpSecurityDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/LogoutDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/Saml2Dsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/RedirectionEndpointDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/UserInfoEndpointDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/TokenEndpointDsl.kt



- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/session/SessionFixationDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/client/AuthorizationCodeGrantDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/SecurityFilters.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/SecurityReactorContextConfiguration.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/HttpPublicKeyPinningDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/HttpStrictTransportSecurityDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ContentTypeOptionsDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/Elements.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ContentSecurityPolicyDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/CacheControlDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/oauth2/client/ClientRegistrationsBeanDefinitionParser.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/SessionManagementDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/HttpSecurityBeanDefinitionParser.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/oauth2/server/resource/OAuth2ResourceServerConfigurer.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AbstractRequestMatcherDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/builders/WebSecurity.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/OAuth2LoginDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/ExceptionHandlerDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/CsrfBeanDefinitionParser.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/HttpConfigurationBuilder.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/CorsDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/OAuth2ClientDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AnonymousDsl.kt
- \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/web/servlet/oauth2/login/AuthorizationEndpointDsl.kt  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/web/servlet/OAuth2ResourceServerDsl.kt  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
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\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/web/configurers/DefaultLoginPageConfigurer.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/web/HttpSecurityBuilder.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/web/configurers/AnonymousConfigurer.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/web/configurers/RequestCacheConfigurer.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/AbstractSecurityBuilder.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsServiceConfig  
urer.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-  
jar/org/springframework/security/config/annotation/web/configuration/SpringWebMvcImportSelector.java  
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jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/InMemoryUserDetails  
ManagerConfigurer.java

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jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/AbstractDaoAuthenticatio  
nConfigurer.java

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jar/org/springframework/security/config/annotation/authentication/configuration/EnableGlobalAuthentication.java

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jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/JdbcUserDetailsManage  
rConfigurer.java

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jar/org/springframework/security/config/annotation/web/configurers/PermitAllSupport.java

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jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsAwareConfig  
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jar/org/springframework/security/config/annotation/web/configurers/AbstractConfigAttributeRequestMatcherRegist  
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Registrar.java

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  - \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/SecurityWebFiltersOrder.java
  - \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/core/userdetails/ReactiveUserDetailsServiceResourceFactoryBean.java
  - \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/provisioning/UserDetailsManagerResourceFactoryBean.java
  - \* /opt/ws\_local/PERMITS\_SQL/1081949386\_1599626452.65/0/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/AbstractServerWebExchangeMatcherRegistry.java
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* /opt/ws_local/PERMITS_SQL/1081949386_1599626452.65/0/spring-security-config-5-3-4-release-sources-
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## 1.142 Icms 2.11

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pnm2png / png2pnm --- conversion from PBM/PGM/PPM-file to PNG-file

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## 1.147 jakarta-mail 1.6.5

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## 1.148 cryptsetup 1.7.5

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## 1.149 busybox 1.30.1

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```
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/web/GenericXmlWebContextLoader.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/junit4/statements/RunBeforeTestMethodCallbacks.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/junit4/statements/SpringRepeat.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
jar/org/springframework/test/context/BootstrapContext.java
* /opt/cola/permits/1138182575_1614269671.49/0/spring-test-5-2-8-release-sources-1-
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jar/org/springframework/test/web/client/ResponseActions.java
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/support/DirtyContextTestExecutionListener.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/BootstrapUtils.java  
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/web/reactive/server/EntityExchangeResult.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/web/ServletTestExecutionListener.java  
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 */
/**
 * Kotlin compliant `WebTestClient.BodySpec` for expectations on the response body decoded
 * to a single Object, see [KT-5464](https://youtrack.jetbrains.com/issue/KT-5464) for
 * more details.
 * @since 5.0.6
 */
```

Found in path(s):  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/web/reactive/server/WebTestClientExtensions.kt  
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- \* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/htmlunit/MockMvcWebConnection.java
- \* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/MockMvcResultMatchersDsl.kt
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- \* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/result/XpathResultMatchers.java
- \* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/reactive/server/DefaultWebTestClientBuilder.java
- \* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/AbstractTransactionalJUnit4SpringContextTests.java
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/event/PrepareTestInstanceEvent.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/mock/jndi/ExpectedLookupTemplate.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-

jar/org/springframework/test/web/servlet/setup/PatternMappingFilterProxy.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/support/AbstractContextLoader.java  
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jar/org/springframework/test/context/support/GenericXmlContextLoader.java  
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jar/org/springframework/test/context/support/DelegatingSmartContextLoader.java  
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jar/org/springframework/test/web/servlet/setup/MockMvcConfigurerAdapter.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/support/GenericPropertiesContextLoader.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/support/DefaultTestContextBootstrapper.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-  
jar/org/springframework/test/context/support/MergedTestPropertySources.java  
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/annotation/Rollback.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/jdbc/SqlConfig.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/annotation/Commit.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/SpringRunner.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/mock/web/DelegatingServletOutputStream.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/ResultHandler.java  
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/request/RequestPostProcessor.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/web/WebTestContextBootstrapper.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/DispatcherServletCustomizer.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/htmlunit/WebRequestMatcher.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/cache/ContextCacheUtils.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/statements/RunAfterTestClassCallbacks.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/ContextCustomizer.java  
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\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/servlet/htmlunit/UrlRegexRequestMatcher.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/web/client/ResponseCreator.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/TestContextBootstrapper.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/junit4/statements/RunAfterTestMethodCallbacks.java  
\* /opt/cola/permits/1138182575\_1614269671.49/0/spring-test-5-2-8-release-sources-1-jar/org/springframework/test/context/ContextCustomizerFactory.java

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jar/com/google/gson/internal/LinkedTreeMap.java
*/opt/cola/permits/1108597571_1606176527.27/0/gson-2-8-6-sources-1-
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- \* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ArrayTypeAdapter.java
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\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/SqlDateTypeAdapter.java  
\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/ConstructorConstructor.java  
\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TimeTypeAdapter.java  
\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/DateTypeAdapter.java  
\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/UnsafeAllocator.java

\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TreeTypeAdapter.java

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\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonSyntaxException.java

\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/internal/Streams.java

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\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/LongSerializationPolicy.java

\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/JsonStreamParser.java

\* /opt/cola/permits/1108597571\_1606176527.27/0/gson-2-8-6-sources-1-jar/com/google/gson/FieldAttributes.java

# 1.153 apr 1.6.5

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From strings/apr\_fnmatch.c, include/apr\_fnmatch.h, misc/unix/getopt.c, file\_io/unix/mktemp.c, strings/apr\_strings.c:

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From network\_io/unix/inet\_ntop.c, network\_io/unix/inet\_pton.c:

```
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```

From dso/aix/dso.c:

```
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From strings/apr\_strnatcmp.c, include/apr\_strings.h:

strnatcmp.c -- Perform 'natural order' comparisons of strings in C.  
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From strings/apr\_snprintf.c:

- \*
- \* cvt - IEEE floating point formatting routines.
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## 1.154 open-vm-tools 9.4.0

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- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJMethodBeforeAdvice.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/ProxyMethodInvocation.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AspectJAdvisorFactory.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAfterAdvice.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAfterThrowingAdvice.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/DefaultAopProxyFactory.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/SingletonAspectInstanceFactory.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/TargetClassAware.java

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- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-

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jar/org/springframework/aop/target/SingletonTargetSource.java  
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  - \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopContext.java
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- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/InterceptorAndDynamicMethodMatcher.java
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- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/SingletonMetadataAwareAspectInstanceFactory.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/aop/Advice.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/Joinpoint.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ProxyFactory.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJAfterReturningAdvice.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AspectJAutoProxyBeanDefinitionParser.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/MetadataAwareAspectInstanceFactory.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/ConstructorInterceptor.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/SimpleMetadataAwareAspectInstanceFactory.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/MethodInvocation.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/TargetSourceCreator.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/Invocation.java

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Found in path(s):

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/AbstractGenericPointcutAdvisor.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AspectComponentDefinition.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/SimpleBeanFactoryAwareAspectInstanceFactory.java

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\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AnnotationAwareAspectJAutoProxyCreator.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AnnotationAwareAspectJAutoProxyCreator.java

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jar/org/springframework/aop/config/AbstractInterceptorDrivenBeanDefinitionDecorator.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-  
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jar/org/springframework/aop/config/MethodLocatingFactoryBean.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-  
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\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-  
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jar/org/springframework/aop/support/ExpressionPointcut.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-  
jar/org/springframework/aop/framework/autoproxy/InfrastructureAdvisorAutoProxyCreator.java  
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- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/DefaultIntroductionAdvisor.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/ClassFilters.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/MethodMatcher.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ObjenesisCglibAopProxy.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/ComposablePointcut.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/interceptor/AsyncUncaughtExceptionHandler.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/MethodMatchers.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/JdkDynamicAopProxy.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/NameMatchMethodPointcut.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/scope/ScopedProxyUtils.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/Pointcuts.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AdvisedSupport.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/AopUtils.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/aopalliance/intercept/Interceptor.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/annotation/AnnotationMatchingPointcut.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/autoproxy/AbstractAutoProxyCreator.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/RootClassFilter.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/AopProxyUtils.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/ReflectiveMethodInvocation.java
- \* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/ControlFlowPointcut.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/annotation/AspectMetadata.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/support/annotation/AnnotationMethodMatcher.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AspectJProxyUtils.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/AbstractAspectJAdvice.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/aspectj/TypePatternClassFilter.java  
\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/ClassFilter.java

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\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/framework/adapter/MethodBeforeAdviceAdapter.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/DynamicIntroductionAdvice.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/SpringConfiguredBeanDefinitionParser.java

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\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/target/ThreadLocalTargetSourceStats.java

\* /opt/cola/permits/1135888174\_1613626055.99/0/spring-aop-5-2-8-release-sources-1-jar/org/springframework/aop/config/AdvisorEntry.java

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* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/AopProxy.java
* /opt/cola/permits/1135888174_1613626055.99/0/spring-aop-5-2-8-release-sources-1-
jar/org/springframework/aop/framework/AopProxyFactory.java
```

# 1.161 curl 7.62.0-DEV

## 1.161.1 Available under license :

License Mixing

=====

libcurl can be built to use a fair amount of various third party libraries, libraries that are written and provided by other parties that are distributed using their own licenses. Even libcurl itself contains code that may cause problems to some. This document attempts to describe what licenses libcurl and the other libraries use and what possible dilemmas linking and mixing them all can lead to for end users.

I am not a lawyer and this is not legal advice!

One common dilemma is that [GPL](<https://www.gnu.org/licenses/gpl.html>) licensed code is not allowed to be linked with code licensed under the [Original BSD license](<https://spdx.org/licenses/BSD-4-Clause.html>) (with the announcement clause). You may still build your own copies that use them all, but distributing them as binaries would be to violate the GPL license - unless you accompany your license with an [exception](<https://www.gnu.org/licenses/gpl-faq.html#GPLIncompatibleLibs>). This particular problem was addressed when the [Modified BSD license](<https://opensource.org/licenses/BSD-3-Clause>) was created, which does not have the announcement clause that collides with GPL.

## libcurl

Uses an [MIT style license](<https://curl.haxx.se/docs/copyright.html>) that is very liberal.

## OpenSSL

(May be used for SSL/TLS support) Uses an Original BSD-style license with an announcement clause that makes it "incompatible" with GPL. You are not allowed to ship binaries that link with OpenSSL that includes GPL code (unless that specific GPL code includes an exception for OpenSSL - a habit that is growing more and more common). If OpenSSL's licensing is a problem for you, consider using another TLS library.



## ## GnuTLS

(May be used for SSL/TLS support) Uses the [LGPL](<https://www.gnu.org/licenses/lgpl.html>) license. If this is a problem for you, consider using another TLS library. Also note that GnuTLS itself depends on and uses other libs (libgcrypt and libgpg-error) and they too are LGPL- or GPL-licensed.

## ## WolfSSL

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## 1.162 ehcache-api 3.8.1

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* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/service/ServiceProvider.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/package-
info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/spi/service/Service.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/UserManagedCache.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/package-info.java
* /opt/cola/permits/1135872726_1613620740.71/0/ehcache-api-3-8-1-sources-1-
jar/org/ehcache/expiry/Expirations.java
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- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/units/EntryUnit.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/SizedResourcePool.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/service/ServiceDependencies.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/expiry/Duration.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/CacheEvent.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/BulkCacheLoadingException.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/Eviction.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateRepository.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheWritingException.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/package-info.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/ValueSupplier.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/resilience/RecoveryStore.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/copy/package-info.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/serialization/StatefulSerializer.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/Status.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/Configuration.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/WriteBehindConfiguration.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/units/MemoryUnit.java
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- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/StateTransitionException.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/expiry/ExpiryPolicy.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/CachePersistenceException.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/PersistentCacheManager.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterConfiguration.java
- \* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/event/EventOrdering.java

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jar/org/ehcache/spi/resilience/ResilienceStrategyProvider.java  
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\* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateHolder.java  
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\* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/WriteBehindProvider.java  
\* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/package-info.java  
\* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/spi/service/PluralService.java  
\* /opt/cola/permits/1135872726\_1613620740.71/0/ehcache-api-3-8-1-sources-1-jar/org/ehcache/config/FluentCacheConfigurationBuilder.java

## 1.163 ical4j 3.0.19

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## 1.164 netty-codec-socks 4.1.51.Final

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\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksSubnegotiationVersion.java  
\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthScheme.java  
\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdStatus.java  
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\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksProtocolVersion.java  
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\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5AddressType.java  
\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/SocksVersion.java  
\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5PasswordAuthStatus.java

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\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/v5/Socks5InitialRequestDecoder.java

\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/v5/Socks5CommandResponseDecoder.java

\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/v4/Socks4Message.java

\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/v5/Socks5Message.java

\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/AbstractSocksMessage.java

\* /opt/ws\_local/PERMITS\_SQL/1077639554\_1597066895.65/0/netty-codec-socks-4-1-51-final-sources-jar/io.netty.handler.codec.socksx/v5/AbstractSocks5Message.java

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jar/io/netty/handler/codec/socksx/v4/Socks4CommandStatus.java  
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## 1.165 libarchive 3.3.3

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## 1.166 protobuf 3.6.1.3-2ubuntu5

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This file contains a list of people who have made large contributions to the public version of Protocol Buffers.

Original Protocol Buffers design and implementation:

Sanjay Ghemawat <sanjay@google.com>

Jeff Dean <jeff@google.com>

Daniel Dulitz <daniel@google.com>

Craig Silverstein

Paul Haahr <haahr@google.com>

Corey Anderson <corin@google.com>

(and many others)

Proto2 C++ and Java primary author:

Kenton Varda <kenton@google.com>

Proto2 Python primary authors:

Will Robinson <robinson@google.com>

Petar Petrov <petar@google.com>

Java Nano primary authors:

Brian Duff <bduff@google.com>

Tom Chao <chaot@google.com>

Max Cai <maxtroy@google.com>

Ulas Kirazci <ulas@google.com>

Large code contributions:

Jason Hsueh <jasonh@google.com>

Joseph Schorr <jschorr@google.com>

Wenbo Zhu <wenboz@google.com>

Large quantity of code reviews:

Scott Bruce <sbruce@google.com>

Frank Yellin

Neal Norwitz <nnorwitz@google.com>

Jeffrey Yasskin <jyasskin@google.com>

Ambrose Feinstein <ambrose@google.com>

Documentation:

Lisa Carey <lcarey@google.com>

Maven packaging:

Gregory Kick <gak@google.com>

Patch contributors:

Kevin Ko <kevin.s.ko@gmail.com>

\* Small patch to handle trailing slashes in --proto\_path flag.

Johan Euphrosine <proppy@aminche.com>

\* Small patch to fix Python CallMethod().

Ulrich Kunitz <kune@deine-taler.de>

\* Small optimizations to Python serialization.

Leandro Lucarella <llucax@gmail.com>

\* VI syntax highlighting tweaks.

\* Fix compiler to not make output executable.

Dilip Joseph <dilip.antony.joseph@gmail.com>

\* Heuristic detection of sub-messages when printing unknown fields in text format.

Brian Atkinson <nairb774@gmail.com>

\* Added @Override annotation to generated Java code where appropriate.

Vincent Choinire <Choiniere.Vincent@hydro.qc.ca>

\* Tru64 support.

Monty Taylor <monty.taylor@gmail.com>

\* Solaris 10 + Sun Studio fixes.

Alek Storm <alek.storm@gmail.com>

\* Slicing support for repeated scalar fields for the Python API.

Oleg Smolsky <oleg.smolsky@gmail.com>

\* MS Visual Studio error format option.

\* Detect unordered\_map in stl\_hash.m4.

Brian Olson <brianolson@google.com>

\* gzip/zlib I/O support.

Michael Poole <mdpoole@troilus.org>

\* Fixed warnings about generated constructors not explicitly initializing all fields (only present with certain compiler settings).

\* Added generation of field number constants.

Wink Saville <wink@google.com>

\* Fixed initialization ordering problem in logging code.

Will Pierce <willp@nuclei.com>

\* Small patch improving performance of in Python serialization.

Alexandre Vassalotti <alexandre@peadrop.com>

\* Emacs mode for Protocol Buffers (editors/protobuf-mode.el).

Scott Stafford <scott.stafford@gmail.com>

\* Added Swap(), SwapElements(), and RemoveLast() to Reflection interface.

Alexander Melnikov <alm@sibmail.ru>

\* HPUX support.

Oliver Jowett <oliver.jowett@gmail.com>

\* Detect whether zlib is new enough in configure script.

\* Fixes for Solaris 10 32/64-bit confusion.

Evan Jones <evanj@mit.edu>

\* Optimize Java serialization code when writing a small message to a stream.



- \* Optimize Java serialization of strings so that UTF-8 encoding happens only once per string per serialization call.
- \* Clean up some Java warnings.
- \* Fix bug with permanent callbacks that delete themselves when run.

Michael Kucharski <m.kucharski@gmail.com>

- \* Added CodedInputStream.getTotalBytesRead().

Kacper Kowalik <xarthisius.kk@gmail.com>

- \* Fixed m4/acx\_pthread.m4 problem for some Linux distributions.

William Orr <will@worrbase.com>

- \* Fixed detection of sched\_yield on Solaris.
- \* Added atomicops for Solaris

Andrew Paprocki <andrew@ishiboo.com>

- \* Fixed minor IBM xLC compiler build issues
- \* Added atomicops for AIX (POWER)

# 1.167 ipmi-tool 1.8.18

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However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an

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You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a) The modified work must itself be a software library.
- b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the

library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

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```
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<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice

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Version 3, 29 June 2007

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For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

## TERMS AND CONDITIONS

### 0. Definitions.

"This License" refers to version 3 of the GNU General Public License.

"Copyright" also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

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To "modify" a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a "modified version" of the earlier work or a work "based on" the earlier work.

A "covered work" means either the unmodified Program or a work based

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#### 1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The "System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's

System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

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#### 6. Conveying Non-Source Forms.

You may convey a covered work in object code form under the terms of sections 4 and 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, in one of these ways:

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- b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.
- c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.
- d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party)

that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

e) Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A "User Product" is either (1) a "consumer product", which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, "normally used" refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

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The requirement to provide Installation Information does not include a

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- \* /opt/ws\_local/PERMITS\_SQL/1077639653\_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyHandler.java
- \* /opt/ws\_local/PERMITS\_SQL/1077639653\_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/package-info.java
- \* /opt/ws\_local/PERMITS\_SQL/1077639653\_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/Socks4ProxyHandler.java
- \* /opt/ws\_local/PERMITS\_SQL/1077639653\_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyConnectionEvent.java
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- \* /opt/ws\_local/PERMITS\_SQL/1077639653\_1597066896.9/0/netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyConnectException.java

## 1.170 bzip2 1.0.6

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Julian Seward, Cambridge, UK.

jseward@acm.org

bzip2/libbzip2 version 1.0.2 of 30 December 2001

/\*

minibz2

libbz2.dll test program.

by Yoshioka Tsuneo (tsuneo@rr.iij4u.or.jp)

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usage: minibz2 [-d] [-{1,2,..9}] [[srcfilename] destfilename]

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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/BinExpr.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/reflect/Metalevel.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/Symbol.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/expr/ExprEditor.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/CtClassType.java  
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jar/javassist/bytecode/analysis/Analyzer.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/expr/Handler.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/AnnotationsAttribute.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/reflect/CannotInvokeException.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/LongVector.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/reflect/Compiler.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/CtNewConstructor.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/LoaderClassPath.java  
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\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/RemoteException.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/Executor.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/MultiType.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/MethodDecl.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/ClassFile.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/MultiArrayType.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/CannotCompileException.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/RuntimeSupport.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/AttributeInfo.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/FieldInfo.java  
\* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/ObjectNotFoundException.java  
No license file was found, but licenses were detected in source scan.

/\*  
\* Javassist, a Java-bytecode translator toolkit.  
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\* for the specific language governing rights and limitations under the  
\* License.  
\*/

Found in path(s):

- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/MemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/AnnotationMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/StringMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/Annotation.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/MemberValueVisitor.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/ClassMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/DoubleMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/FloatMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/EnumMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/CharMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/ByteMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/BooleanMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/IntegerMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/ShortMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/ArrayMemberValue.java
- \* /opt/cola/permits/1135880377\_1613624050.66/0/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/LongMemberValue.java

## 1.172 jctools-core 3.0.0

### 1.172.1 Available under license :

No license file was found, but licenses were detected in source scan.

```
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4_0_0.xsd">
 <modelVersion>4.0.0</modelVersion>

 <artifactId>jctools-core</artifactId>
 <groupId>org.jctools</groupId>
 <version>3.0.0</version>
 <name>Java Concurrency Tools Core Library</name>
```

<description>Java Concurrency Tools Core Library</description>

<packaging>bundle</packaging>

<dependencies>

<dependency>

<groupId>org.hamcrest</groupId>

<artifactId>hamcrest-all</artifactId>

<version>\${hamcrest.version}</version>

<scope>test</scope>

</dependency>

<dependency>

<groupId>junit</groupId>

<artifactId>junit</artifactId>

<version>\${junit.version}</version>

<scope>test</scope>

</dependency>

<dependency>

<groupId>com.google.guava</groupId>

<artifactId>guava-testlib</artifactId>

<version>\${guava-testlib.version}</version>

<scope>test</scope>

</dependency>

</dependencies>

<build>

<plugins>

<plugin>

<groupId>org.apache.maven.plugins</groupId>

<artifactId>maven-surefire-plugin</artifactId>

<version>3.0.0-M3</version>

<configuration>

<includes>

<include>\*</include>

</includes>

</configuration>

</plugin>

<plugin>

<groupId>org.apache.felix</groupId>

<artifactId>maven-bundle-plugin</artifactId>

<version>4.2.1</version>

<extensions>>true</extensions>

<configuration>

<instructions>

<Import-Package>sun.misc;resolution:=optional</Import-Package>

</instructions>

</configuration>

</plugin>

```

<plugin>
 <groupId>org.apache.maven.plugins</groupId>
 <artifactId>maven-source-plugin</artifactId>
 <version>3.2.0</version>
 <executions>
 <execution>
 <id>attach-sources</id>
 <phase>verify</phase>
 <goals>
 <goal>jar-no-fork</goal>
 </goals>
 </execution>
 </executions>
</plugin>
<plugin>
 <groupId>org.apache.maven.plugins</groupId>
 <artifactId>maven-javadoc-plugin</artifactId>
 <version>3.1.1</version>
 <configuration>
 <additionalOptions>
 <additionalOption>-Xdoclint:none</additionalOption>
 </additionalOptions>
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 </configuration>
 <executions>
 <execution>
 <id>attach-javadocs</id>
 <goals>
 <goal>jar</goal>
 </goals>
 </execution>
 </executions>
</plugin>
</plugins>
</build>

<distributionManagement>
 <repository>
 <id>bintray-jctools-jctools</id>
 <name>jctools-jctools</name>
 <url>https://api.bintray.com/maven/jctools/jctools/jctools-core/;publish=1</url>
 </repository>
</distributionManagement>

<url>https://github.com/JCTools</url>
<inceptionYear>2013</inceptionYear>

<licenses>

```

```
<license>
 <name>Apache License, Version 2.0</name>
 <url>http://www.apache.org/licenses/LICENSE-2.0.txt</url>
 <distribution>repo</distribution>
</license>
</licenses>

<scm>
 <url>https://github.com/JCTools/JCTools</url>
 <connection>scm:git:https://github.com/JCTools/JCTools</connection>
 <tag>HEAD</tag>
</scm>

<developers>
 <developer>
 <url>https://github.com/nitsanw</url>
 </developer>
 <developer>
 <url>https://github.com/mjpt777</url>
 </developer>
 <developer>
 <url>https://github.com/RichardWarburton</url>
 </developer>
 <developer>
 <url>https://github.com/kay</url>
 </developer>
 <developer>
 <url>https://github.com/franz1981</url>
 </developer>
</developers>

<prerequisites>
 <maven>3.5.0</maven>
</prerequisites>

<properties>
 <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
 <java.version>1.6</java.version>
 <java.test.version>1.8</java.test.version>

 <maven.compiler.source>${java.version}</maven.compiler.source>
 <maven.compiler.target>${java.version}</maven.compiler.target>
 <maven.compiler.testSource>${java.test.version}</maven.compiler.testSource>
 <maven.compiler.testTarget>${java.test.version}</maven.compiler.testTarget>

 <hamcrest.version>1.3</hamcrest.version>
 <junit.version>4.12</junit.version>
 <guava-testlib.version>21.0</guava-testlib.version>
```



```
</properties>
</project>
```

Found in path(s):

```
* /opt/cola/permits/1177956791_1625584358.42/0/jctools-core-3-0-0-5-jar/META-INF/maven/org.jctools/jctools-core/pom.xml
```

No license file was found, but licenses were detected in source scan.

Manifest-Version: 1.0

Bnd-LastModified: 1578049665284

Build-Jdk: 1.8.0\_232

Built-By: yak

Bundle-Description: Java Concurrency Tools Core Library

Bundle-License: <http://www.apache.org/licenses/LICENSE-2.0.txt>

Bundle-ManifestVersion: 2

Bundle-Name: Java Concurrency Tools Core Library

Bundle-SymbolicName: org.jctools.core

Bundle-Version: 3.0.0

Created-By: Apache Maven Bundle Plugin

Export-Package: org.jctools.maps;version="3.0.0",org.jctools.util;version="3.0.0";uses:="sun.misc",org.jctools.queues;version="3.0.0";uses:="org.jctools.queues.spec",org.jctools.queues.spec;version="3.0.0",org.jctools.queues.atomic;version="3.0.0";uses:="org.jctools.queues,org.jctools.queues.spec"

Import-Package: sun.misc;resolution:=optional

Require-Capability: osgi.ee;filter:="(&(osgi.ee=JavaSE)(version=1.6))"

Tool: Bnd-4.2.0.201903051501

Found in path(s):

```
* /opt/cola/permits/1177956791_1625584358.42/0/jctools-core-3-0-0-5-jar/META-INF/MANIFEST.MF
```

## 1.173 tzdata 2016h

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## 1.174 dhcpcd 9.1.1

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## 1.175 chardet 3.0.4

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Version 2.1, February 1999

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d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above



specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

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# 1.176 libjpeg-turbo 2.0.3-0ubuntu1.20.04.1

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## 1.177 flyway-test 6.4.0

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jar/org/flywaydb/test/annotation/package-info.java  
\* /opt/cola/permits/1129909867\_1612394256.07/0/flyway-test-6-4-0-sources-  
jar/org/flywaydb/test/annotation/FlywayTest.java  
\* /opt/cola/permits/1129909867\_1612394256.07/0/flyway-test-6-4-0-sources-  
jar/org/flywaydb/test/annotation/FlywayTests.java

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jar/org/springframework/jdbc/core/namedparam/MapSqlParameterSourceExtensions.kt



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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/incrementer/DB2MainframeSequenceMaxValueIncrementer.java
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jar/org/springframework/jdbc/support/xml/SqlXmlValue.java
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jar/org/springframework/jdbc/datasource/init/ScriptParseException.java
```

\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/SQLExceptionSubclassTranslator.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/AbstractDriverBasedDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/xml/Jdbc4SqlXmlHandler.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/lookup/BeanFactoryDataSourceLookup.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/lob/PassThroughClob.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/PostgresCallMetaDataProvider.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/support/SqlLobValue.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/SybaseCallMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/OracleCallMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/DelegatingDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/lob/PassThroughBlob.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseFactoryBean.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/init/DataSourceInitializer.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/config/InitializeDatabaseBeanDefinitionParser.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/simple/SimpleJdbcInsert.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/config/EmbeddedDatabaseBeanDefinitionParser.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/CustomSQLExceptionCodesTranslation.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/ConnectionProxy.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/lookup/AbstractRoutingDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/SqlServerCallMetaDataProvider.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/embedded/SimpleDriverDataSourceFactory.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

jar/org/springframework/jdbc/datasource/init/ScriptException.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/support/rowset/SqlRowSetMetaData.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/init/CannotReadScriptException.java  
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jar/org/springframework/jdbc/support/incrementer/SqlServerMaxValueIncrementer.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
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jar/org/springframework/jdbc/datasource/DriverManagerDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/SingleConnectionDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/metadata/GenericTableMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/SimpleDriverDataSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/SqlReturnTypes.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/init/DatabasePopulatorUtils.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/namedparam/NamedParameterJdbcTemplate.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/init/ScriptUtils.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/metadata/CallMetaDataProviderFactory.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/JdbcOperations.java

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/GenericCallMetaDataProvider.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/DataSourceFactory.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/StatementCreatorUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/DataSourceTransactionManager.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/NamedParameterJdbcOperations.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/embedded/AbstractEmbeddedDatabaseConfigurer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/JdbcTemplate.java
```

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jar/org/springframework/jdbc/core/namedparam/SqlParameterSource.java
```

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/init/ResourceDatabasePopulator.java
```

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/simple/AbstractJdbcCall.java
```

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLStateSQLExceptionTranslator.java
```

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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/SingleColumnRowMapper.java
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/LazyConnectionDataSourceProxy.java
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```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
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jar/org/springframework/jdbc/core/simple/AbstractJdbcInsert.java  
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jar/org/springframework/jdbc/support/rowset/ResultSetWrappingSqlRowSet.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/datasource/JdbcTransactionObjectSupport.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/namedparam/BeanPropertySqlParameterSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/object/SqlFunction.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/BeanPropertyRowMapper.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/namedparam/AbstractSqlParameterSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/support/AbstractLobStreamingResultSetExtractor.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/PreparedStatementCreatorFactory.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/support/rowset/SqlRowSet.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/namedparam/MapSqlParameterSource.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/core/namedparam/NamedParameterUtils.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/support/JdbcUtils.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/object/RdbmsOperation.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-  
jar/org/springframework/jdbc/support/KeyHolder.java  
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```
/**
 * Implement this interface when parameters need to be customized based
 * on the connection. We might need to do this to make use of proprietary
 * features, available only with a specific Connection type.
 *
 * @author Rod Johnson
 * @author Thomas Risberg
 * @see CallableStatementCreatorFactory#newCallableStatementCreator(ParameterMapper)
 * @see org.springframework.jdbc.object.StoredProcedure#execute(ParameterMapper)
 */
/**
 * Create a Map of input parameters, keyed by name.
 * @param con a JDBC connection. This is useful (and the purpose of this interface)
 * if we need to do something RDBMS-specific with a proprietary Connection
 * implementation class. This class conceals such proprietary details. However,
 * it is best to avoid using such proprietary RDBMS features if possible.
 * @return a Map of input parameters, keyed by name (never { @code null })
 * @throws SQLException if an SQLException is encountered setting
 * parameter values (that is, there's no need to catch SQLException)
 */
```

Found in path(s):

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/ParameterMapper.java
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/JdbcOperationsExtensions.kt
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/lob/AbstractLobHandler.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/lob/LobHandler.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/DatabaseMetaDataCallback.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/PreparedStatementSetter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-

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jar/org/springframework/jdbc/core/RowCallbackHandler.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/lookup/DataSourceLookup.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/ParsedSql.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/datasource/init/CompositeDatabasePopulator.java
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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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*/
/**
* Strategy interface for translating between { @link SQLException SQLExceptions }
* and Spring's data access strategy-agnostic { @link DataAccessException }
* hierarchy.
*
* <p>Implementations can be generic (for example, using
* { @link java.sql.SQLException#getSQLState() SQLState } codes for JDBC) or wholly
* proprietary (for example, using Oracle error codes) for greater precision.
*
* @author Rod Johnson
* @author Juergen Hoeller
* @see org.springframework.dao.DataAccessException
*/
```

```
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* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/SQLExceptionTranslator.java
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```

```
/**
* The classes in this package make JDBC easier to use and
* reduce the likelihood of common errors. In particular, they:
*
* Simplify error handling, avoiding the need for try/catch/finally
```

- \* blocks in application code.
- \* <li>Present exceptions to application code in a generic hierarchy of
- \* unchecked exceptions, enabling applications to catch data access
- \* exceptions without being dependent on JDBC, and to ignore fatal
- \* exceptions there is no value in catching.
- \* <li>Allow the implementation of error handling to be modified
- \* to target different RDBMSes without introducing proprietary
- \* dependencies into application code.
- \* </ul>
- \* <p>This package and related packages are discussed in Chapter 9 of
- \* <a href="https://www.amazon.com/exec/obidos/tg/detail/-/0764543857/">Expert One-On-One J2EE Design and Development</a>
- \* by Rod Johnson (Wrox, 2002).
- \*/

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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/init/ScriptStatementFailedException.java

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*/
/**
* Close this LobCreator session and free its temporarily created BLOBs and CLOBs.
* Will not need to do anything if using PreparedStatement's standard methods,
* but might be necessary to free database resources if using proprietary means.
* <p>NOTE</p>: Needs to be invoked after the involved PreparedStatements have
* been executed or the affected O/R mapping sessions have been flushed.
* Otherwise, the database resources for the temporary BLOBs might stay allocated.
*/
```

Found in path(s):

```
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/support/lob/LobCreator.java
```

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jar/org/springframework/jdbc/support/incrementer/MySQLMaxValueIncrementer.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/namedparam/NamedParameterBatchUpdateUtils.java
* /opt/cola/permits/1135888248_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-
jar/org/springframework/jdbc/core/metadata/TableMetaDataProviderFactory.java
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/HsqlTableMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/lookup/IsolationLevelDataSourceRouter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/RowCountCallbackHandler.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/rowset/ResultSetWrappingSqlRowSetMetaData.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/SqlReturnResultSet.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/simple/SimpleJdbcInsertOperations.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/ConnectionHolder.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/incrementer/AbstractDataFieldMaxValueIncrementer.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/ArgumentTypePreparedStatementSetter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/support/JdbcBeanDefinitionReader.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/ParameterizedPreparedStatementSetter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/LobRetrievalFailureException.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseConfigurer.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/SqlTypeValue.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/AbstractFallbackSQLExceptionTranslator.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/StoredProcedure.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/SqlInOutParameter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/incrementer/OracleSequenceMaxValueIncrementer.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/RowMapper.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/ResultSetSupportingSqlParameter.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/TableParameterMetaData.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/SqlUpdate.java

\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/SQLExceptionTranslator.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/simple/SimpleJdbcCallOperations.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/DerbyCallMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/metadata/PostgresTableMetaDataProvider.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/CustomSQLExceptionTranslatorRegistrar.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/incrementer/AbstractIdentityColumnMaxValueIncrementer.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/MappingSqlQueryWithParameters.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/incrementer/Db2LuwMaxValueIncrementer.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/SqlQuery.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/ResultSetExtractor.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/core/SqlReturnUpdateCount.java  
\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/support/incrementer/DerbyMaxValueIncrementer.java  
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\* /opt/cola/permits/1135888248\_1613626225.19/0/spring-jdbc-5-2-8-release-sources-1-jar/org/springframework/jdbc/object/GenericSqlQuery.java  
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## 1.179 flyway-commandline 7.3.1

### 1.179.1 Available under license :

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# 1.180 e2fsprogs 1.43.1

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This is the Debian GNU/Linux prepackaged version of the static EXT2 file system consistency checker (e2fsck.static). The EXT2 utilities were written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

Sources were obtained from <http://sourceforge.net/projects/e2fsprogs>

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\*/

Index: tdbsa/tdb.c

=====

--- tdbsa.orig/tdb.c

+++ tdbsa/tdb.c

@@ -4,11 +4,11 @@ Rev: 23371

Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)

\*/

/\*

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- trivial database library - private includes
- 
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Theodore Ts'o  
23-June-2007

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This package was added to the e2fsprogs debian source package by Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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This is the Debian GNU/Linux prepackaged version of the ss command-line interface parsing library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:  
[tsx-11.mit.edu:/pub/linux/packages/ext2fs/](http://tsx-11.mit.edu:/pub/linux/packages/ext2fs/)

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#

# This is a Makefile stub which handles the creation of BSD shared  
# libraries.

#

# In order to use this stub, the following makefile variables must be defined.

#

# BSDLIB\_VERSION = 1.0

# BSDLIB\_IMAGE = libce

# BSDLIB\_MYDIR = et

# BSDLIB\_INSTALL\_DIR = \$(SHLIBDIR)

#

all:: image

real-subdirs:: Makefile

@echo " MKDIR pic"

@mkdir -p pic

BSD\_LIB = \$(BSDLIB\_IMAGE).so.\$(BSDLIB\_VERSION)

BSDLIB\_PIC\_FLAG = -fpic

image: \$(BSD\_LIB)

\$(BSD\_LIB): \$(OBJS)

(cd pic; ld -Bshareable -o \$(BSD\_LIB) \$(LDFLAGS\_SHLIB) \$(OBJS))

\$(MV) pic/\$(BSD\_LIB) .

\$(RM) -f ../\$(BSD\_LIB)

(cd ..; \$(LN) \$(LINK\_BUILD\_FLAGS) \

`echo \$(my\_dir) | sed -e 's;lib/;;'"/\$(BSD\_LIB) \$(BSD\_LIB))

install-shlibs install:: \$(BSD\_LIB)

@echo " INSTALL\_PROGRAM \$(BSDLIB\_INSTALL\_DIR)/\$(BSD\_LIB)"

@\$(INSTALL\_PROGRAM) \$(BSD\_LIB) \

\$(DESTDIR)\$(BSDLIB\_INSTALL\_DIR)/\$(BSD\_LIB)

@-\$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

```
uninstall-shlibs uninstall::
$(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
```

```
clean::
$(RM) -rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ../$(BSD_LIB)
```

This is the Debian GNU/Linux prepackaged version of the Common Error Description library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:  
tsx-11.mit.edu:/pub/linux/packages/ext2fs/

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Gadi Oxman, August 1995

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## 1.182 activation-api 1.1

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# 1.183 libvmtools 9.4.0.25793

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Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is

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The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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Thus, it is not the intent of this section to claim rights or contest

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)



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d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

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- e) Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded

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README for release 6b of 27-Mar-1998

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## DOCUMENTATION ROADMAP

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This file contains the following sections:

OVERVIEW        General description of JPEG and the IJG software.  
LEGAL ISSUES    Copyright, lack of warranty, terms of distribution.  
REFERENCES     Where to learn more about JPEG.  
ARCHIVE LOCATIONS Where to find newer versions of this software.  
RELATED SOFTWARE Other stuff you should get.  
FILE FORMAT WARS Software \*not\* to get.  
TO DO           Plans for future IJG releases.

Other documentation files in the distribution are:

User documentation:

install.doc    How to configure and install the IJG software.  
usage.doc     Usage instructions for cjpeg, djpeg, jpegtran,  
              rdjpgcom, and wrjpgcom.  
\*.1            Unix-style man pages for programs (same info as usage.doc).  
wizard.doc    Advanced usage instructions for JPEG wizards only.  
change.log    Version-to-version change highlights.

Programmer and internal documentation:

libjpeg.doc   How to use the JPEG library in your own programs.  
example.c     Sample code for calling the JPEG library.  
structure.doc  Overview of the JPEG library's internal structure.  
filelist.doc   Road map of IJG files.  
coderrules.doc Coding style rules --- please read if you contribute code.

Please read at least the files install.doc and usage.doc. Useful information can also be found in the JPEG FAQ (Frequently Asked Questions) article. See ARCHIVE LOCATIONS below to find out where to obtain the FAQ article.

If you want to understand how the JPEG code works, we suggest reading one or more of the REFERENCES, then looking at the documentation files (in roughly the order listed) before diving into the code.

## OVERVIEW

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This package contains C software to implement JPEG image compression and decompression. JPEG (pronounced "jay-peg") is a standardized compression method for full-color and gray-scale images. JPEG is intended for compressing "real-world" scenes; line drawings, cartoons and other non-realistic images are not its strong suit. JPEG is lossy, meaning that the output image is not exactly identical to the input image. Hence you must not use JPEG if you have to have identical output bits. However, on typical photographic images, very good compression levels can be obtained with no visible change, and remarkably high compression levels are possible if you can tolerate a low-quality image. For more details, see the references, or just experiment with various compression settings.

This software implements JPEG baseline, extended-sequential, and progressive compression processes. Provision is made for supporting all variants of these processes, although some uncommon parameter settings aren't implemented yet. For legal reasons, we are not distributing code for the arithmetic-coding variants of JPEG; see LEGAL ISSUES. We have made no provision for supporting the hierarchical or lossless processes defined in the standard.

We provide a set of library routines for reading and writing JPEG image files, plus two sample applications "cjpeg" and "djpeg", which use the library to perform conversion between JPEG and some other popular image file formats. The library is intended to be reused in other applications.

In order to support file conversion and viewing software, we have included considerable functionality beyond the bare JPEG coding/decoding capability; for example, the color quantization modules are not strictly part of JPEG decoding, but they are essential for output to colormapped file formats or colormapped displays. These extra functions can be compiled out of the library if not required for a particular application. We have also included "jpegtran", a utility for lossless transcoding between different JPEG processes, and "rdjpgcom" and "wrjpgcom", two simple applications for inserting and extracting textual comments in JFIF files.

The emphasis in designing this software has been on achieving portability and flexibility, while also making it fast enough to be useful. In particular, the software is not intended to be read as a tutorial on JPEG. (See the REFERENCES section for introductory material.) Rather, it is intended to be reliable, portable, industrial-strength code. We do not claim to have achieved that goal in every aspect of the software, but we strive for it.

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The Unix configuration script "configure" was produced with GNU Autoconf. It is copyright by the Free Software Foundation but is freely distributable. The same holds for its supporting scripts (config.guess, config.sub, ltconfig, ltmain.sh). Another support script, install-sh, is copyright by M.I.T. but is also freely distributable.

It appears that the arithmetic coding option of the JPEG spec is covered by patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic coding cannot legally be used without obtaining one or more licenses. For this reason, support for arithmetic coding has been removed from the free JPEG software. (Since arithmetic coding provides only a marginal gain over the unpatented Huffman mode, it is unlikely that very many implementations will support it.) So far as we are aware, there are no patent restrictions on the remaining code.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce "uncompressed GIFs". This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

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## REFERENCES

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We highly recommend reading one or more of these references before trying to understand the innards of the JPEG software.

The best short technical introduction to the JPEG compression algorithm is

Wallace, Gregory K. "The JPEG Still Picture Compression Standard", Communications of the ACM, April 1991 (vol. 34 no. 4), pp. 30-44. (Adjacent articles in that issue discuss MPEG motion picture compression, applications of JPEG, and related topics.) If you don't have the CACM issue handy, a PostScript file containing a revised version of Wallace's article is available at <ftp://ftp.uu.net/graphics/jpeg/wallace.ps.gz>. The file (actually a preprint for an article that appeared in IEEE Trans. Consumer Electronics) omits the sample images that appeared in CACM, but it includes corrections and some added material. Note: the Wallace article is copyright ACM and IEEE, and it may not be used for commercial purposes.

A somewhat less technical, more leisurely introduction to JPEG can be found in "The Data Compression Book" by Mark Nelson and Jean-loup Gailly, published by M&T Books (New York), 2nd ed. 1996, ISBN 1-55851-434-1. This book provides good explanations and example C code for a multitude of compression methods including JPEG. It is an excellent source if you are comfortable reading C code but don't know much about data compression in general. The book's JPEG sample code is far from industrial-strength, but when you are ready to look at a full implementation, you've got one here...

The best full description of JPEG is the textbook "JPEG Still Image Data Compression Standard" by William B. Pennebaker and Joan L. Mitchell, published by Van Nostrand Reinhold, 1993, ISBN 0-442-01272-1. Price US\$59.95, 638 pp. The book includes the complete text of the ISO JPEG standards (DIS 10918-1 and draft DIS 10918-2). This is by far the most complete exposition of JPEG in existence, and we highly recommend it.

The JPEG standard itself is not available electronically; you must order a paper copy through ISO or ITU. (Unless you feel a need to own a certified official copy, we recommend buying the Pennebaker and Mitchell book instead; it's much cheaper and includes a great deal of useful explanatory material.) In the USA, copies of the standard may be ordered from ANSI Sales at (212) 642-4900, or from Global Engineering Documents at (800) 854-7179. (ANSI doesn't take credit card orders, but Global does.) It's not cheap: as of 1992, ANSI was charging \$95 for Part 1 and \$47 for Part 2, plus 7% shipping/handling. The standard is divided into two parts, Part 1 being the actual specification, while Part 2 covers compliance testing methods. Part 1 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 1: Requirements and guidelines" and has document numbers ISO/IEC IS 10918-1, ITU-T T.81. Part 2 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 2: Compliance testing" and has document numbers ISO/IEC IS 10918-2, ITU-T T.83.

Some extensions to the original JPEG standard are defined in JPEG Part 3, a newer ISO standard numbered ISO/IEC IS 10918-3 and ITU-T T.84. IJG currently does not support any Part 3 extensions.

The JPEG standard does not specify all details of an interchangeable file

format. For the omitted details we follow the "JFIF" conventions, revision 1.02. A copy of the JFIF spec is available from:

Literature Department  
C-Cube Microsystems, Inc.  
1778 McCarthy Blvd.  
Milpitas, CA 95035  
phone (408) 944-6300, fax (408) 944-6314

A PostScript version of this document is available by FTP at <ftp://ftp.uu.net/graphics/jpeg/jfif.ps.gz>. There is also a plain text version at <ftp://ftp.uu.net/graphics/jpeg/jfif.txt.gz>, but it is missing the figures.

The TIFF 6.0 file format specification can be obtained by FTP from <ftp://ftp.sgi.com/graphics/tiff/TIFF6.ps.gz>. The JPEG incorporation scheme found in the TIFF 6.0 spec of 3-June-92 has a number of serious problems. IJG does not recommend use of the TIFF 6.0 design (TIFF Compression tag 6). Instead, we recommend the JPEG design proposed by TIFF Technical Note #2 (Compression tag 7). Copies of this Note can be obtained from <ftp.sgi.com> or from <ftp://ftp.uu.net/graphics/jpeg/>. It is expected that the next revision of the TIFF spec will replace the 6.0 JPEG design with the Note's design. Although IJG's own code does not support TIFF/JPEG, the free libtiff library uses our library to implement TIFF/JPEG per the Note. libtiff is available from <ftp://ftp.sgi.com/graphics/tiff/>.

## ARCHIVE LOCATIONS

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The "official" archive site for this software is <ftp.uu.net> (Internet address 192.48.96.9). The most recent released version can always be found there in directory <graphics/jpeg>. This particular version will be archived as <ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>. If you don't have direct Internet access, UUNET's archives are also available via UUCP; contact [help@uunet.uu.net](mailto:help@uunet.uu.net) for information on retrieving files that way.

Numerous Internet sites maintain copies of the UUNET files. However, only <ftp.uu.net> is guaranteed to have the latest official version.

You can also obtain this software in DOS-compatible "zip" archive format from the SimTel archives (<ftp://ftp.simtel.net/pub/simtelnet/msdos/graphics/>), or on CompuServe in the Graphics Support forum (GO CIS:GRAPHSUP), library 12 "JPEG Tools". Again, these versions may sometimes lag behind the <ftp.uu.net> release.

The JPEG FAQ (Frequently Asked Questions) article is a useful source of general information about JPEG. It is updated constantly and therefore is not included in this distribution. The FAQ is posted every two weeks to Usenet newsgroups <comp.graphics.misc>, <news.answers>, and other groups.

It is available on the World Wide Web at <http://www.faqs.org/faqs/jpeg-faq/> and other news.answers archive sites, including the official news.answers archive at [rtfm.mit.edu: ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/](ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/). If you don't have Web or FTP access, send e-mail to [mail-server@rtfm.mit.edu](mailto:mail-server@rtfm.mit.edu) with body  
send usenet/news.answers/jpeg-faq/part1  
send usenet/news.answers/jpeg-faq/part2

## RELATED SOFTWARE

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Numerous viewing and image manipulation programs now support JPEG. (Quite a few of them use this library to do so.) The JPEG FAQ described above lists some of the more popular free and shareware viewers, and tells where to obtain them on Internet.

If you are on a Unix machine, we highly recommend Jef Poskanzer's free PBPLUS software, which provides many useful operations on PPM-format image files. In particular, it can convert PPM images to and from a wide range of other formats, thus making `cjpeg/djpeg` considerably more useful. The latest version is distributed by the NetPBM group, and is available from numerous sites, notably <ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/>. Unfortunately PBPLUS/NETPBM is not nearly as portable as the IJG software is; you are likely to have difficulty making it work on any non-Unix machine.

A different free JPEG implementation, written by the PVRG group at Stanford, is available from <ftp://havefun.stanford.edu/pub/jpeg/>. This program is designed for research and experimentation rather than production use; it is slower, harder to use, and less portable than the IJG code, but it is easier to read and modify. Also, the PVRG code supports lossless JPEG, which we do not. (On the other hand, it doesn't do progressive JPEG.)

## FILE FORMAT WARS

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Some JPEG programs produce files that are not compatible with our library. The root of the problem is that the ISO JPEG committee failed to specify a concrete file format. Some vendors "filled in the blanks" on their own, creating proprietary formats that no one else could read. (For example, none of the early commercial JPEG implementations for the Macintosh were able to exchange compressed files.)

The file format we have adopted is called JFIF (see REFERENCES). This format has been agreed to by a number of major commercial JPEG vendors, and it has become the de facto standard. JFIF is a minimal or "low end" representation. We recommend the use of TIFF/JPEG (TIFF revision 6.0 as modified by TIFF

Technical Note #2) for "high end" applications that need to record a lot of additional data about an image. TIFF/JPEG is fairly new and not yet widely supported, unfortunately.

The upcoming JPEG Part 3 standard defines a file format called SPIFF. SPIFF is interoperable with JFIF, in the sense that most JFIF decoders should be able to read the most common variant of SPIFF. SPIFF has some technical advantages over JFIF, but its major claim to fame is simply that it is an official standard rather than an informal one. At this point it is unclear whether SPIFF will supersede JFIF or whether JFIF will remain the de-facto standard. IJG intends to support SPIFF once the standard is frozen, but we have not decided whether it should become our default output format or not. (In any case, our decoder will remain capable of reading JFIF indefinitely.)

Various proprietary file formats incorporating JPEG compression also exist. We have little or no sympathy for the existence of these formats. Indeed, one of the original reasons for developing this free software was to help force convergence on common, open format standards for JPEG files. Don't use a proprietary file format!

TO DO

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The major thrust for v7 will probably be improvement of visual quality. The current method for scaling the quantization tables is known not to be very good at low Q values. We also intend to investigate block boundary smoothing, "poor man's variable quantization", and other means of improving quality-vs-file-size performance without sacrificing compatibility.

In future versions, we are considering supporting some of the upcoming JPEG Part 3 extensions --- principally, variable quantization and the SPIFF file format.

As always, speeding things up is of great interest.

Please send bug reports, offers of help, etc. to [jpeg-info@uunet.uu.net](mailto:jpeg-info@uunet.uu.net).

# 1.187 grpc-go 1.9.1

## 1.187.1 Available under license :

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## 1.188 goprotobuf 2.4.1

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## 1.193 sizeof 0.3.0

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# 1.194 ffmpeg 4.3.1

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Specifically, the GPL parts of FFmpeg are:

- libpostproc
- optional x86 optimization in the files
  - ``libavcodec/x86/flac_dsp_gpl.asm``
  - ``libavcodec/x86/idct_mmx.c``
  - ``libavfilter/x86/vf_removegrain.asm``
- the following building and testing tools
  - ``compat/solaris/make_sunver.pl``
  - ``doc/t2h.pm``
  - ``doc/txi2pod.pl``
  - ``libswresample/tests/swresample.c``
  - ``tests/checkasm/*``
  - ``tests/tiny_ssim.c``
- the following filters in libavfilter:
  - ``signature_lookup.c``
  - ``vf_blackframe.c``
  - ``vf_boxblur.c``
  - ``vf_colormatrix.c``
  - ``vf_cover_rect.c``
  - ``vf_croptdetect.c``
  - ``vf_delogo.c``
  - ``vf_eq.c``
  - ``vf_find_rect.c``
  - ``vf_fspp.c``
  - ``vf_histeq.c``

- `vf\_hqdn3d.c`
- `vf\_kerndeint.c`
- `vf\_lensfun.c` (GPL version 3 or later)
- `vf\_mcdeint.c`
- `vf\_mpdecimate.c`
- `vf\_nnedi.c`
- `vf\_owdenoise.c`
- `vf\_perspective.c`
- `vf\_phase.c`
- `vf\_pp.c`
- `vf\_pp7.c`
- `vf\_pullup.c`
- `vf\_repeatfields.c`
- `vf\_sab.c`
- `vf\_signature.c`
- `vf\_smartblur.c`
- `vf\_spp.c`
- `vf\_stereo3d.c`
- `vf\_super2xsai.c`
- `vf\_tinterlace.c`
- `vf\_uspp.c`
- `vf\_vaguedenoiser.c`
- `vsrc\_mptestsrc.c`

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There are a handful of files under other licensing terms, namely:

- \* The files `libavcodec/jfdctfst.c`, `libavcodec/jfdctint\_template.c` and `libavcodec/jrevdct.c` are taken from libjpeg, see the top of the files for licensing details. Specifically note that you must credit the IJG in the documentation accompanying your program if you only distribute executables. You must also indicate any changes including additions and deletions to those three files in the documentation.
- \* `tests/reference.pnm` is under the expat license.

## ## External libraries

FFmpeg can be combined with a number of external libraries, which sometimes affect the licensing of binaries resulting from the combination.

## ### Compatible libraries

The following libraries are under GPL version 2:

- avisynth
- frei0r
- libcdio
- libdavs2
- librubberband
- libvidstab
- libx264
- libx265
- libxavs
- libxavs2
- libxvid

When combining them with FFmpeg, FFmpeg needs to be licensed as GPL as well by passing `--enable-gpl` to configure.

The following libraries are under LGPL version 3:

- gmp
- libaribb24
- liblensfun

When combining them with FFmpeg, use the configure option `--enable-version3` to upgrade FFmpeg to the LGPL v3.

The VMAF, mbedTLS, RK MPI, OpenCORE and VisualOn libraries are under the Apache License 2.0. That license is incompatible with the LGPL v2.1 and the GPL v2, but not with version 3 of those licenses. So to combine these libraries with FFmpeg, the license version needs to be upgraded by passing `--enable-version3` to configure.

The smbclient library is under the GPL v3, to combine it with FFmpeg, the options `--enable-gpl` and `--enable-version3` have to be passed to configure to upgrade FFmpeg to the GPL v3.

### ### Incompatible libraries

There are certain libraries you can combine with FFmpeg whose licenses are not compatible with the GPL and/or the LGPL. If you wish to enable these libraries, even in circumstances that their license may be incompatible, pass `--enable-nonfree` to configure. This will cause the resulting binary to be unredistributable.

The Fraunhofer FDK AAC and OpenSSL libraries are under licenses which are incompatible with the GPLv2 and v3. To the best of our knowledge, they are compatible with the LGPL.

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Version 3, 29 June 2007

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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package engine

```
import (
 "bytes"
 "encoding/json"
 "strings"
 "testing"
 "time"

 "github.com/docker/cli/cli/command/formatter"
 "github.com/docker/cli/internal/licenseutils"
 "github.com/docker/licensing/model"
 "gotest.tools/assert"
 is "gotest.tools/assert/cmp"
)

func TestSubscriptionContextWrite(t *testing.T) {
 cases := []struct {
 context formatter.Context
 expected string
 }{
 // Errors
 {
 formatter.Context{Format: "{{InvalidFunction}}"},
 `Template parsing error: template: :1: function "InvalidFunction" not defined`
 },
 {
 formatter.Context{Format: "{{nil}}"},
 `Template parsing error: template: :1:2: executing "" at <nil>: nil is not a command`
 },
 // Table format
```

```

{
 formatter.Context{Format: NewSubscriptionsFormat("table", false)},
 `NUM OWNER PRODUCT ID EXPIRES PRICING COMPONENTS
1 owner1 productid1 2020-01-01 10:00:00 +0000 UTC compstring
2 owner2 productid2 2020-01-01 10:00:00 +0000 UTC compstring
`,
},
{
 formatter.Context{Format: NewSubscriptionsFormat("table", true)},
 `1:License Name: name1 Quantity: 10 nodes Expiration date: 2020-01-01
2:License Name: name2 Quantity: 20 nodes Expiration date: 2020-01-01
`,
},
{
 formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", false)},
 `OWNER
owner1
owner2
`,
},
{
 formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", true)},
 `OWNER
owner1
owner2
`,
 // Raw Format
 {
 formatter.Context{Format: NewSubscriptionsFormat("raw", false)},
 `license: id1
name: name1
owner: owner1
components: compstring

license: id2
name: name2
owner: owner2
components: compstring
`,
 },
 {
 formatter.Context{Format: NewSubscriptionsFormat("raw", true)},
 `license: id1
license: id2
`,
 },
},

```

```

// Custom Format
{
 formatter.Context{Format: NewSubscriptionsFormat("{{.Owner}}", false)},
 `owner1
owner2
`,
},
}

```

```

expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")

```

```

for _, testcase := range cases {
subscriptions := []licenseutils.LicenseDisplay{
{
 Num: 1,
 Owner: "owner1",
 Subscription: model.Subscription{
 ID: "id1",
 Name: "name1",
 ProductID: "productid1",
 Expires: &expiration,
 PricingComponents: model.PricingComponents{
 &model.SubscriptionPricingComponent{
 Name: "nodes",
 Value: 10,
 },
 },
 },
 ComponentsString: "compstring",
},
{
 Num: 2,
 Owner: "owner2",
 Subscription: model.Subscription{
 ID: "id2",
 Name: "name2",
 ProductID: "productid2",
 Expires: &expiration,
 PricingComponents: model.PricingComponents{
 &model.SubscriptionPricingComponent{
 Name: "nodes",
 Value: 20,
 },
 },
 },
 ComponentsString: "compstring",
},
}
}

```

```

out := &bytes.Buffer{}
testcase.context.Output = out
err := SubscriptionsWrite(testcase.context, subscriptions)
if err != nil {
 assert.Error(t, err, testcase.expected)
} else {
 assert.Check(t, is.Equal(testcase.expected, out.String()))
}
}
}

func TestSubscriptionContextWriteJSON(t *testing.T) {
 expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")
 subscriptions := []licenseutils.LicenseDisplay{
 {
 Num: 1,
 Owner: "owner1",
 Subscription: model.Subscription{
 ID: "id1",
 Name: "name1",
 ProductID: "productid1",
 Expires: &expiration,
 PricingComponents: model.PricingComponents{
 &model.SubscriptionPricingComponent{
 Name: "nodes",
 Value: 10,
 },
 },
 },
 ComponentsString: "compstring",
 },
 {
 Num: 2,
 Owner: "owner2",
 Subscription: model.Subscription{
 ID: "id2",
 Name: "name2",
 ProductID: "productid2",
 Expires: &expiration,
 PricingComponents: model.PricingComponents{
 &model.SubscriptionPricingComponent{
 Name: "nodes",
 Value: 20,
 },
 },
 },
 ComponentsString: "compstring",
 },
 },
}
}

```

```

}
expectedJSONs := []map[string]interface{}{
{
"Owner": "owner1",
"ComponentsString": "compstring",
"Expires": "2020-01-01T10:00:00Z",
"DockerID": "",
"Eusa": nil,
"ID": "id1",
"Start": nil,
"Name": "name1",
"Num": float64(1),
"PricingComponents": []interface{}{
map[string]interface{}{
"name": "nodes",
"value": float64(10),
},
},
"ProductID": "productid1",
"ProductRatePlan": "",
"ProductRatePlanID": "",
"State": "",
"Summary": "License Name: name1\tQuantity: 10 nodes\tExpiration date: 2020-01-01",
},
{
"Owner": "owner2",
"ComponentsString": "compstring",
"Expires": "2020-01-01T10:00:00Z",
"DockerID": "",
"Eusa": nil,
"ID": "id2",
"Start": nil,
"Name": "name2",
"Num": float64(2),
"PricingComponents": []interface{}{
map[string]interface{}{
"name": "nodes",
"value": float64(20),
},
},
"ProductID": "productid2",
"ProductRatePlan": "",
"ProductRatePlanID": "",
"State": "",
"Summary": "License Name: name2\tQuantity: 20 nodes\tExpiration date: 2020-01-01",
},
}
}

```



```

out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .}}", Output: out}, subscriptions)
if err != nil {
 t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
 var m map[string]interface{ }
 if err := json.Unmarshal([]byte(line), &m); err != nil {
 t.Fatal(err)
 }
 assert.Check(t, is.DeepEqual(expectedJSONs[i], m))
}
}

func TestSubscriptionContextWriteJSONField(t *testing.T) {
 subscriptions := []licenseutils.LicenseDisplay{
 {Num: 1, Owner: "owner1"},
 {Num: 2, Owner: "owner2"},
 }
 out := &bytes.Buffer{ }
 err := SubscriptionsWrite(formatter.Context{Format: "{{json .Owner}}", Output: out}, subscriptions)
 if err != nil {
 t.Fatal(err)
 }
 for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
 var s string
 if err := json.Unmarshal([]byte(line), &s); err != nil {
 t.Fatal(err)
 }
 assert.Check(t, is.Equal(subscriptions[i].Owner, s))
 }
}

```

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package licensing

```
import (
 "context"
 "crypto/hmac"
 "crypto/sha256"
 "encoding/base64"
 "encoding/json"
 "fmt"
 "time"

 "github.com/docker/libtrust"
 "github.com/docker/licensing/lib/errors"
 "github.com/docker/licensing/lib/go-clientlib"
 "github.com/docker/licensing/model"
)

func (c *client) getLicenseFile(ctx context.Context, subID string) (*model.IssuedLicense, error) {
 url := c.baseURI
 url.Path += fmt.Sprintf("/api/billing/v4/subscriptions/%s/license-file", subID)

 license := new(model.IssuedLicense)
 if _, _, err := c.doReq(ctx, "GET", &url, clientlib.RecvJSON(license)); err != nil {
 return nil, err
 }

 return license, nil
}

// Check verifies that the license identified by the given key id is valid. Note that it does not
// interrogate the contents of the license.
func (c *client) check(ctx context.Context, license model.IssuedLicense) (*model.CheckResponse, error) {
 keyID := license.KeyID
 privateKey := license.PrivateKey

 authorization, err := c.getAuthorization(ctx, license)
 if err != nil {
 return nil, err
 }

 // TODO: Mason - replace this parseJWS with a non libtrust lib
 signature, err := libtrust.ParseJWS(authorization)
 if err != nil {
 return nil, errors.Wrapf(err, errors.Fields{
```

```

 "key_id": keyID,
 }, "license parse JWS failed")
}

keys, err := signature.Verify()
if err != nil {
 return nil, errors.Wrapf(err, errors.Fields{
 "key_id": keyID,
 }, "license signature verification failed")
}

keyCnt := len(keys)
if keyCnt != 1 {
 err = fmt.Errorf("unexpected number of signing keys (%d)", keyCnt)
 return nil, errors.WithStack(err).With(errors.Fields{
 "key_id": keyID,
 })
}

key := keys[0]

if !c.recognizedSigningKey(key) {
 return nil, errors.New("unrecognized signing key")
}

payload, err := signature.Payload()
if err != nil {
 return nil, errors.Wrapf(err, errors.Fields{
 "key_id": keyID,
 }, "malformed signature payload")
}

checkRes := new(model.CheckResponse)

err = json.Unmarshal(payload, &checkRes)
if err != nil {
 return nil, errors.Wrapf(err, errors.Fields{
 "key_id": keyID,
 }, "license payload unmarshal failed")
}

msg := checkRes.Expiration.Format(time.RFC3339)
if err := checkToken(msg, checkRes.Token, privateKey); err != nil {
 return nil, errors.Wrap(err, errors.Fields{
 "key_id": keyID,
 })
}
}

```

```

return checkRes, nil
}

// recognizedSigningKey returns true if the given key is signed with a recognized signing key, false otherwise
func (c *client) recognizedSigningKey(key libtrust.PublicKey) bool {
for _, publicKey := range c.publicKeys {
if key.KeyID() == publicKey.KeyID() {
return true
}
}
return false
}

// getAuthorization returns the decoded license authorization
func (c *client) getAuthorization(ctx context.Context, license model.IssuedLicense) ([]byte, error) {
decoded, err := base64.StdEncoding.DecodeString(license.Authorization)
if err != nil {
return nil, errors.Wrapf(err, errors.Fields{
"key_id": license.KeyID,
}, "decoding license authorization failed")
}
return decoded, nil
}

// All of the functions in this file assume that they are receiving a properly
// formatted private key.

// checkToken performs a MAC algorithm (where token is generated by hashing the
// message with the privateKey via GenerateToken) with the purpose of authenticating
// the validity of both the message and the private key of the person who generated
// the token.
func checkToken(message, token, privateKey string) error {
tokenBytes, err := base64.URLEncoding.DecodeString(token)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

generatedToken, err := generateToken(message, privateKey)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

generatedBytes, err := base64.URLEncoding.DecodeString(generatedToken)
if err != nil {
return errors.Wrap(err, errors.Fields{"token": token})
}

if !hmac.Equal(tokenBytes, generatedBytes) {

```

```

return errors.Forbidden(errors.Fields{"token": token}, "invalid token")
}

return nil
}

// generateToken generates a hash of the message with the privateKey via the
// sha256 algorithm.
func generateToken(message, privateKey string) (string, error) {
key, err := base64.URLEncoding.DecodeString(privateKey)
if err != nil {
return "", errors.Wrap(err, errors.Fields{"msg": message})
}

h := hmac.New(sha256.New, key)
h.Write([]byte(message))
return base64.URLEncoding.EncodeToString(h.Sum(nil)), nil
}

```

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procs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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```
import "time"

// A CheckResponse is the internal content of the PublicCheckResponse signed
// json blob.
type CheckResponse struct {
 Expiration time.Time `json:"expiration"`
 Token string `json:"token"`
 MaxEngines int `json:"maxEngines"`
 ScanningEnabled bool `json:"scanningEnabled"`
 Type string `json:"licenseType"`
 Tier string `json:"tier"`
}

// IssuedLicense represents an issued license
type IssuedLicense struct {
 KeyID string `json:"key_id"`
 PrivateKey string `json:"private_key"`
 Authorization string `json:"authorization"`
}

// Valid returns true if the License is syntactically valid, false otherwise
func (l *IssuedLicense) Valid() (bool, string) {
 if l.KeyID == "" {
 return false, "empty key_id"
 }

 if l.PrivateKey == "" {
 return false, "empty private_key"
 }

 if l.Authorization == "" {
 return false, "empty authorization"
 }

 return true, ""
}
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```

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package engine

```
import (
 "time"
```

```
 "github.com/docker/cli/cli/command/formatter"
 "github.com/docker/cli/internal/licenseutils"
 "github.com/docker/licensing/model"
)
```

```
const (
 defaultSubscriptionsTableFormat = "table"
 {{{.Num}}}\t{.Owner}}\t{.ProductID}}\t{.Expires}}\t{.ComponentsString}}"
 defaultSubscriptionsQuietFormat = "{{.Num}}:{{.Summary}}"
```

```
 numHeader = "NUM"
 ownerHeader = "OWNER"
 licenseNameHeader = "NAME"
 idHeader = "ID"
 dockerIDHeader = "DOCKER ID"
 productIDHeader = "PRODUCT ID"
 productRatePlanHeader = "PRODUCT RATE PLAN"
 productRatePlanIDHeader = "PRODUCT RATE PLAN ID"
 startHeader = "START"
 expiresHeader = "EXPIRES"
 stateHeader = "STATE"
 eusaHeader = "EUSA"
 pricingComponentsHeader = "PRICING COMPONENTS"
)
```

```
// NewSubscriptionsFormat returns a Format for rendering using a license Context
```

```
func NewSubscriptionsFormat(source string, quiet bool) formatter.Format {
 switch source {
 case formatter.TableFormatKey:
 if quiet {
 return defaultSubscriptionsQuietFormat
 }
 return defaultSubscriptionsTableFormat
 case formatter.RawFormatKey:
 if quiet {
 return `license: {{.ID}}`
 }
 return `license: {{.ID}}\nname: {{.Name}}\nowner: {{.Owner}}\ncomponents: {{.ComponentsString}}\n`
 }
 return formatter.Format(source)
}
```

```
// SubscriptionsWrite writes the context
```

```

func SubscriptionsWrite(ctx formatter.Context, subs []licenseutils.LicenseDisplay) error {
 render := func(format func(subContext formatter.SubContext) error) error {
 for _, sub := range subs {
 licenseCtx := &licenseContext{trunc: ctx.Trunc, l: sub}
 if err := format(licenseCtx); err != nil {
 return err
 }
 }
 return nil
 }
 licenseCtx := licenseContext{}
 licenseCtx.Header = map[string]string{
 "Num": numHeader,
 "Owner": ownerHeader,
 "Name": licenseNameHeader,
 "ID": idHeader,
 "DockerID": dockerIDHeader,
 "ProductID": productIDHeader,
 "ProductRatePlan": productRatePlanHeader,
 "ProductRatePlanID": productRatePlanIDHeader,
 "Start": startHeader,
 "Expires": expiresHeader,
 "State": stateHeader,
 "Eusa": eusaHeader,
 "ComponentsString": pricingComponentsHeader,
 }
 return ctx.Write(&licenseCtx, render)
}

type licenseContext struct {
 formatter.HeaderContext
 trunc bool
 l licenseutils.LicenseDisplay
}

func (c *licenseContext) MarshalJSON() ([]byte, error) {
 return formatter.MarshalJSON(c)
}

func (c *licenseContext) Num() int {
 return c.l.Num
}

func (c *licenseContext) Owner() string {
 return c.l.Owner
}

func (c *licenseContext) ComponentsString() string {

```

```

return c.l.ComponentsString
}

func (c *licenseContext) Summary() string {
return c.l.String()
}

func (c *licenseContext) Name() string {
return c.l.Name
}

func (c *licenseContext) ID() string {
return c.l.ID
}

func (c *licenseContext) DockerID() string {
return c.l.DockerID
}

func (c *licenseContext) ProductID() string {
return c.l.ProductID
}

func (c *licenseContext) ProductRatePlan() string {
return c.l.ProductRatePlan
}

func (c *licenseContext) ProductRatePlanID() string {
return c.l.ProductRatePlanID
}

func (c *licenseContext) Start() *time.Time {
return c.l.Start
}

func (c *licenseContext) Expires() *time.Time {
return c.l.Expires
}

func (c *licenseContext) State() string {
return c.l.State
}

func (c *licenseContext) Eusa() *model.EusaState {
return c.l.Eusa
}

func (c *licenseContext) PricingComponents() []model.SubscriptionPricingComponent {

```

```
// Dereference the pricing component pointers in the pricing components
// so it can be rendered properly with the template formatter
```

```
var ret []model.SubscriptionPricingComponent
for _, spc := range c.l.PricingComponents {
 if spc == nil {
 continue
 }
 ret = append(ret, *spc)
}
return ret
}
```

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# 1.198 bridgeutils 1.5

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THE BASIC LIBRARY FUNCTIONS

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Written by: Philip Hazel

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Version 2.1, February 1999

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# 1.210 objenesis 3.1

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# 1.211 expat 2.2.0

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## 1.212 ehcache-core 3.8.1

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```

Found in path(s):

```
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/time/package-info.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/store/StoreSupport.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/statistics/TierOperationOutcomes.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/AbstractWrapperStoreProvider.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/events/StoreEventFilter.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/time/TimeSourceService.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
```

jar/org/ehcache/core/statistics/StoreOperationOutcomes.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/CacheConfigurationProperty.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/exceptions/StorePassThroughException.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/config/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/InternalRuntimeConfiguration.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/tiering/LowerCachingTier.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/service/CacheManagerProviderService.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/HumanReadable.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/time/TickingTimeSource.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/Store.java  
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jar/org/ehcache/core/internal/resilience/ThrowingResilienceStrategy.java  
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\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/heap/SizeOfEngine.java  
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jar/org/ehcache/core/statistics/ValueStatistic.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/service/StatisticsService.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
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\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
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\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/DefaultTierStatistics.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/events/StoreEvent.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/events/package-info.java  
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jar/org/ehcache/core/spi/service/package-info.java  
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jar/org/ehcache/core/statistics/TierStatistics.java  
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jar/org/ehcache/core/spi/time/SystemTimeSource.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/statistics/CachingTierOperationOutcomes.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/config/ExpiryUtils.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/statistics/Jsr107LatencyMonitor.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/events/CacheEventDispatcherFactory.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/spi/store/tiering/AuthoritativeTier.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/spi/service/DiskResourceService.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/events/CacheEventListenerConfiguration.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/statistics/SuppliedValueStatistic.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/spi/store/tiering/HigherCachingTier.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/CacheConfigurationChangeListener.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/exceptions/ExceptionFactory.java  
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\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/EhcacheRuntimeConfiguration.java  
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jar/org/ehcache/core/spi/service/FileBasedPersistenceContext.java  
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jar/org/ehcache/core/statistics/BulkOps.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/LifeCycledAdapter.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/CacheConfigurationChangeEvent.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/util/ByteBufferInputStream.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/DefaultCacheStatistics.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/tiering/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/service/ServiceUtils.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/InternalStatus.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/events/StoreEventSource.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-

jar/org/ehcache/core/statistics/LatencyHistogramConfiguration.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/config/store/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/DefaultStatisticsService.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/events/CacheEventListenerProvider.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/config/store/StoreEventSourceConfiguration.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/heap/SizeOfEngineProvider.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/store/StoreConfigurationImpl.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/EhcacheManager.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/heap/LimitExceededException.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/Jsr107Cache.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/exceptions/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/ChainedOperationObserver.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/spi/store/AbstractValueHolder.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/events/NullStoreEventDispatcher.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/HigherCachingTierOperationOutcomes.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/events/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/DelegatingOperationStatistic.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/package-info.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/events/StoreEventDispatcher.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/util/CollectionUtil.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/events/CacheManagerListener.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/StatsUtils.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/statistics/CacheOperationOutcomes.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-  
jar/org/ehcache/core/config/store/StoreStatisticsConfiguration.java  
\* /opt/cola/permits/1135872870\_1613620715.23/0/ehcache-core-3-8-1-sources-1-

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jar/org/ehcache/core/osgi/OsgiServiceLoader.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/events/CacheEvents.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/WrapperStore.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/SpecIterator.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-jar/org/ehcache/core/Ehcache.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/statistics/OperationObserver.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/InternalCacheManager.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/package-info.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/InternalCache.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/resilience/DefaultRecoveryStore.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/statistics/AuthoritativeTierOperationOutcomes.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/service/LocalPersistenceService.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/events/CacheEventDispatcher.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/service/ExecutionService.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/statistics/DelegatingOperationObserver.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/util/ClassLoading.java
* /opt/cola/permits/1135872870_1613620715.23/0/ehcache-core-3-8-1-sources-1-
jar/org/ehcache/core/spi/store/heap/package-info.java

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## 1.213 open-ldap 2.4.58

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## 1.214 acpid 2.0.11

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```
Gnomovision version 69, Copyright (C) 19yy name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
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## 1.215 jquery 3.5.1

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## 1.216 libunistring 0.9.10 2

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```
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/\* nettle-internal.c

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#### ARCFOUR

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#### CAMELLIA

The C implementation is by Nippon Telegraph and Telephone Corporation (NTT), heavily modified by Niels Miller. Assembler for x86 and x86\_64 by Niels Miller. Released under the LGPL.

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#### CAST128

The implementation of the CAST128 cipher is written by Steve Reid. Released into the public domain.

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#### DES

The implementation of the DES cipher is written by Dana L. How, and released under the LGPL.

.

#### MD2

The implementation of MD2 is written by Andrew Kuchling, and hacked some by Andreas Sigfridsson and Niels Miller. Python Cryptography Toolkit license (essentially public domain).

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#### MD4

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#### MD5

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#### SHA1

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#### SHA224, SHA256, SHA384, and SHA512

Written by Niels Miller, using Peter Gutmann's SHA1 code as a model. Released under the LGPL.

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#### TWOFISH

The implementation of the TWOFISH cipher is written by Ruud de Rooij. Released under the LGPL.

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#### RSA

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## 1.223 asm 5.0.4

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jar/org/objectweb/asm/xml/SAXClassAdapter.java  
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jar/org/objectweb/asm/xml/SAXAdapter.java  
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\* Creates a new JSRInliner. *<i>Subclasses must not use this  
\* constructor</i>*. Instead, they must use the  
\* { @link #JSRInlinerAdapter(int, MethodVisitor, int, String, String, String, String[])}  
\* version.  
\*  
\* @param mv  
\* the `MethodVisitor` to send the resulting inlined  
\* method code to (use `null` for none).  
\* @param access  
\* the method's access flags (see { @link Opcodes}). This  
\* parameter also indicates if the method is synthetic and/or  
\* deprecated.  
\* @param name  
\* the method's name.  
\* @param desc  
\* the method's descriptor (see { @link Type}).  
\* @param signature  
\* the method's signature. May be `null`.  
\* @param exceptions  
\* the internal names of the method's exception classes (see  
\* { @link Type#getInternalName() getInternalName}). May be  
\* `null`.  
\* @throws IllegalStateException  
\* If a subclass calls this constructor.  
\*/

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```

* Creates a new { @link GeneratorAdapter }. <i>Subclasses must not use this
* constructor</i>. Instead, they must use the
* { @link #GeneratorAdapter(int, MethodVisitor, int, String, String)}
* version.
*
* @param mv
* the method visitor to which this adapter delegates calls.
* @param access
* the method's access flags (see { @link Opcodes}).
* @param name
* the method's name.
* @param desc
* the method's descriptor (see { @link Type Type}).
* @throws IllegalStateException
* If a subclass calls this constructor.
*/

```

Found in path(s):

```

* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/commons/GeneratorAdapter.java

```

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```

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```

```

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```

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\*/

/\*\*

\* Constructs a new {@link Textifier}. *Subclasses must not use this*

\* constructor*.* Instead, they must use the {@link #Textifier(int)}

\* version.

\*

\* @throws IllegalStateException

\* If a subclass calls this constructor.

\*/

Found in path(s):

\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/Textifier.java

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\*/

/\*\*

\* Constructs a new {@link ClassNode}. *Subclasses must not use this*

\* constructor*.* Instead, they must use the {@link #ClassNode(int)}

```
* version.
*
* @throws IllegalStateException
* If a subclass calls this constructor.
*/
```

Found in path(s):

```
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/ClassNode.java
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```

```
/**
```

```
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```

```
*/
```

```
/**
```

```
* Constructs a new { @link LocalVariableAnnotationNode }. <i>Subclasses must
* not use this constructor</i>. Instead, they must use the
* { @link #LocalVariableAnnotationNode(int, TypePath, LabelNode[], LabelNode[], int[], String) }
* version.
*
* @param typeRef
* a reference to the annotated type. See { @link TypeReference }.
* @param typePath
```



- \* the path to the annotated type argument, wildcard bound, array
- \* element type, or static inner type within 'typeRef'. May be
- \* <tt>null</tt> if the annotation targets 'typeRef' as a whole.
- \* @param start
- \* the first instructions corresponding to the continuous ranges
- \* that make the scope of this local variable (inclusive).
- \* @param end
- \* the last instructions corresponding to the continuous ranges
- \* that make the scope of this local variable (exclusive). This
- \* array must have the same size as the 'start' array.
- \* @param index
- \* the local variable's index in each range. This array must have
- \* the same size as the 'start' array.
- \* @param desc
- \* the class descriptor of the annotation class.
- \*/

Found in path(s):

\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LocalVariableAnnotationNode.java

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\*/

Found in path(s):

\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Label.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Type.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/AnnotationWriter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SimpleVerifier.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/NameMapping.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/Printer.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/Shrinker.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Method.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckAnnotationAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingSignatureAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingFieldAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassWriter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Attribute.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SourceInterpreter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MethodInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceFieldVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SourceValue.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/AdviceAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Remapper.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicValue.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldWriter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ByteVector.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/AbstractInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Interpreter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-

jar/org/objectweb/asm/tree/JumpInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/TableSwitchGenerator.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FieldNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/FieldInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LabelNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/ClassConstantsCollector.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/util/CheckSignatureAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/BasicVerifier.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/CodeSizeEvaluator.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/InstructionAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/IntInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/RemappingClassAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/MultiANewArrayInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassReader.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/VarInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/RemappingMethodAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/Value.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/StaticInitMerger.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/AnnotationConstantsCollector.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/AnnotationVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/signature/SignatureReader.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/LdcInsnNode.java  
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jar/org/objectweb/asm/tree/LookupSwitchInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/LineNumberNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/JarOptimizer.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-

jar/org/objectweb/asm/commons/LocalVariablesSorter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/util/TraceAnnotationVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/Constant.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/TypeAnnotationNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Handle.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/TryCatchBlockNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/ClassOptimizer.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/ASMifier.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/util/TraceClassVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/TableSwitchInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/Frame.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/InvokeDynamicInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/AnalyzerException.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/Subroutine.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/SerialVersionUIDAdder.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/InnerClassNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/ParameterNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/LocalVariableNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/Analyzer.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/analysis/SmallSet.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/commons/RemappingAnnotationAdapter.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/TypeInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/util/TraceSignatureVisitor.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/tree/IncInsnNode.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-  
jar/org/objectweb/asm/optimizer/MethodOptimizer.java  
\* /opt/cola/permits/1135863767\_1613617914.89/0/asm-5-0-4-sources-6-

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jar/org/objectweb/asm/util/CheckFieldAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Frame.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/util/CheckMethodAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/commons/SimpleRemapper.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/tree/AnnotationNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Context.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/util/TraceMethodVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/optimizer/MethodConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Handler.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/tree/MethodNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnList.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/optimizer/FieldConstantsCollector.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodWriter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/tree/analysis/BasicInterpreter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/signature/SignatureWriter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/commons/TryCatchBlockSorter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Item.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Edge.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassVisitor.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/tree/FrameNode.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/optimizer/ConstantPool.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-jar/org/objectweb/asm/Opcodes.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/util/CheckClassAdapter.java
* /opt/cola/permits/1135863767_1613617914.89/0/asm-5-0-4-sources-6-
jar/org/objectweb/asm/signature/SignatureVisitor.java
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/**
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/\*\*

\* Creates a new {[AnalyzerAdapter](#)}. *Subclasses must not use this*

\* constructor*.* Instead, they must use the

\* {[AnalyzerAdapter\(int, String, int, String, String, MethodVisitor\)](#)}

\* version.

\*

\* @param owner

\* the owner's class name.

\* @param access

\* the method's access flags (see {[Opcodes](#)}).

\* @param name

\* the method's name.

\* @param desc

\* the method's descriptor (see {[Type Type](#)}).

\* @param mv

\* the method visitor to which this adapter delegates calls. May

\* be `null`.

\* @throws `IllegalStateException`

\* If a subclass calls this constructor.

\*/

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*/opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/transaction/support/SmartTransactionObject.java
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Found in path(s):

```
*/opt/cola/permits/1135888131_1613626079.1/0/spring-tx-5-2-8-release-sources-1-
jar/org/springframework/transaction/support/ResourceHolder.java
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\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/jca/context/ResourceAdapterApplicationContext.java  
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\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/TransactionSystemException.java  
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jar/org/springframework/transaction/event/TransactionPhase.java  
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\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/config/JtaTransactionManagerFactoryBean.java  
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\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/reactive/TransactionalOperatorImpl.java

\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/interceptor/TransactionAttribute.java  
\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/annotation/SpringTransactionAnnotationParser.java  
\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-jar/org/springframework/transaction/annotation/Ejb3TransactionAnnotationParser.java  
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jar/org/springframework/jca/support/LocalConnectionFactoryBean.java  
\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/support/ResourceTransactionDefinition.java  
\* /opt/cola/permits/1135888131\_1613626079.1/0/spring-tx-5-2-8-release-sources-1-  
jar/org/springframework/transaction/support/TransactionSynchronizationUtils.java

## 1.226 libssh 0.9.3 2ubuntu2.1

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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Contributors to bttv:

Michael Chu <mmchu@pobox.com>

AverMedia fix and more flexible card recognition

Alan Cox <alan@lxorguk.ukuu.org.uk>

Video4Linux interface and 2.1.x kernel adaptation

Chris Kleitsch

Hardware I2C

Gerd Knorr <kraxel@cs.tu-berlin.de>

Radio card (ITT sound processor)

bigfoot <bigfoot@net-way.net>

Ragnar Hojland Espinosa <ragnar@macula.net>

ConferenceTV card

+ many more (please mail me if you are missing in this list and would like to be mentioned)

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/\* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)

\* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)

\*

\* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.

\* <http://www.hypermall.com/>

\* 10/1/97 - commented out CFG\_PHYIE bit - we don't care when the PHY

\* interrupts us (except possibly for removal/insertion of the cable?)

\* 10/4/97 - began heavy inline documentation of the code. Corrected typos

\* and spelling mistakes.

\* 10/5/97 - added code to handle PHY interrupts, disable PHY on

\* loss of link, and correctly re-enable PHY when link is

\* re-established. (put back CFG\_PHYIE)

\*

\* Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.

\*

\* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997

\*

\* Linux driver for the IDT77201 NICStAR PCI ATM controller.

\* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;

\* see init\_nicstar() for PHY initialization to change this. This driver

\* expects the Linux ATM stack to support scatter-gather lists

\* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.

\*

\* Implementing minimal-copy of received data:

```

* IDT always receives data into a small buffer, then large buffers
* as needed. This means that data must always be copied to create
* the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
* Fix is simple: make large buffers large enough to hold entire
* SDU, and leave <small_buffer_data> bytes empty at the start. Then
* copy small buffer contents to head of large buffer.
* Trick is to avoid fragmenting Linux, due to need for a lot of large
* buffers. This is done by 2 things:
* 1) skb->destructor / skb->atm.recycle_buffer
* combined, allow nicstar_free_rx_skb to be called to
* recycle large data buffers
* 2) skb_clone of received buffers
* See nicstar_free_rx_skb and linearize_buffer for implementation
* details.
*
*
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* Foundation, Inc., 675 Mass Ave, Cambridge, MA 02139, USA.
*
* M. Welsh, 6 July 1996
*
*
*/

```

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for his contributions to the dvb-net driver

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for CyberLogin for Linux which allows logging onto EON  
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Andreas Oberritter <obi@linuxtv.org>

Dennis Noermann <dennis.noermann@noernet.de>

Felix Domke <tmbinc@elitedvb.net>

Florian Schirmer <jolt@tuxbox.org>

Ronny Strutz <3des@elitedvb.de>

Wolfram Joost <dbox2@frokaschwei.de>

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for the nxt2004 frontend driver

Kirk Lapray <kirk.lapray@gmail.com>  
for the or51211 and or51132 frontend drivers, and  
for merging the nxt2002 and nxt2004 modules into a  
single nxt200x frontend driver.

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Gocheck - A rich testing framework for Go

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Support for streaming Protocol Buffer messages for the Go language (golang).

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## 1.240 spring-context-support 5.2.8.RELEASE

### 1.240.1 Available under license :

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```

Found in path(s):

```
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/JCacheCache.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/caffeine/CaffeineCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/ehcache/EhCacheCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/config/AbstractJCacheConfiguration.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/JCacheCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
```



jar/org/springframework/cache/caffeine/CaffeineCache.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/commonj/WorkManagerTaskExecutor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/ehcache/EhCacheCache.java  
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```

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#####
```

```


Defaults for the Java Activation Framework (revised).

Modified extensions registered in this file:
text/plain java c c++ cpp pl cc h
image/png png
image/svg+xml svg

#####
```

```
text/html html htm HTML HTM
text/plain txt text TXT TEXT java c c++ cpp pl cc h
image/gif gif GIF
image/ief ief
image/jpeg jpeg jpg jpe JPG
image/tiff tiff tif
image/x-xwindowdump xwd
application/postscript ai eps ps
application/rtf rtf
application/x-tex tex
application/x-texinfo texinfo texi
application/x-troff t tr roff
audio/basic au
audio/midi midi mid
```

audio/x-aifc aifc  
audio/x-aiff aif aiff  
audio/x-mpeg mpeg mpg  
audio/x-wav wav  
video/mpeg mpeg mpg mpe  
video/quicktime qt mov  
video/x-msvideo avi

```


Additional file types adapted from
http://sites.utoronto.ca/webdocs/HTMLdocs/Book/Book-3ed/appb/mimetype.html
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#####
```

# TEXT TYPES

text/x-speech talk  
text/css css  
text/csv csv

# IMAGE TYPES

# X-Windows bitmap (b/w)  
image/x-xbitmap xbm  
# X-Windows pixmap (8-bit color)  
image/x-xpixmap xpm  
# Portable Network Graphics  
image/png png  
# Scalable Vector Graphics  
image/svg+xml svg  
# Image Exchange Format (RFC 1314)  
image/ief ief  
# RGB  
image/rgb rgb  
# Group III Fax (RFC 1494)  
image/g3fax g3f  
# X Windowdump format  
image/x-xwindowdump xwd  
# Macintosh PICT format  
image/x-pict pict  
# PPM (UNIX PPM package)  
image/x-portable-pixmap ppm  
# PGM (UNIX PPM package)  
image/x-portable-graymap pgm  
# PBM (UNIX PPM package)  
image/x-portable-bitmap pbm

```

PNM (UNIX PPM package)
image/x-portable-anymap pnm
Microsoft Windows bitmap
image/x-ms-bmp bmp
CMU raster
image/x-cmu-raster ras
Kodak Photo-CD
image/x-photo-cd pcd
Computer Graphics Metafile
image/cgm cgm
CALS Type 1 or 2
image/x-cals mil cal
Fractal Image Format (Iterated Systems)
image/fif fif
QuickSilver active image (Micrografx)
image/x-mgx-dsf dsf
CMX vector image (Corel)
image/x-cmx cmx
Wavelet-compressed (Summus)
image/wavelet wi
AutoCad Drawing (SoftSource)
image/vnd.dwg dwg
AutoCad DXF file (SoftSource)
image/vnd.dxf dxf
Simple Vector Format (SoftSource)
image/vnd.svf svf

AUDIO/VOICE/MUSIC RELATED TYPES

""basic""audio - 8-bit u-law PCM"
audio/basic au snd
Macintosh audio format (AIpple)
audio/x-aiff aif aiff aifc
Microsoft audio
audio/x-wav wav
MPEG audio
audio/x-mpeg mpa abs mpega
MPEG-2 audio
audio/x-mpeg-2 mp2a mpa2
compressed speech (Echo Speech Corp.)
audio/echospeech es
Toolvox speech audio (Voxware)
audio/voxware vox
RapidTransit compressed audio (Fast Man)
application/fastman lcc
Realaudio (Progressive Networks)
application/x-pn-realaudio ra ram
MIDI music data

```

x-music/x-midi mmid  
# Koan music data (SSeyo)  
application/vnd.koan skp  
# Speech synthesis data (MVP Solutions)  
text/x-speech talk

#### # VIDEO TYPES

# MPEG video  
video/mpeg mpeg mpg mpe  
# MPEG-2 video  
video/mpeg-2 mpv2 mp2v  
# Macintosh Quicktime  
video/quicktime qt mov  
# Microsoft video  
video/x-msvideo avi  
# SGI Movie format  
video/x-sgi-movie movie  
# VDOLive streaming video (VDOnet)  
video/vdo vdo  
# Vivo streaming video (Vivo software)  
video/vnd.vivo viv

#### # SPECIAL HTTP/WEB APPLICATION TYPES

# Proxy autoconfiguration (Netscape browsers)  
application/x-ns-proxy-autoconfig pac  
# Netscape Cooltalk chat data (Netscape)  
x-conference/x-cooltalk ice

#### # TEXT-RELATED

# PostScript  
application/postscript ai eps ps  
# Microsoft Rich Text Format  
application/rtf rtf  
# Adobe Acrobat PDF  
application/pdf pdf  
# Maker Interchange Format (FrameMaker)  
application/vnd.mif mif  
# Troff document  
application/x-troff t tr roff  
# Troff document with MAN macros  
application/x-troff-man man  
# Troff document with ME macros  
application/x-troff-me me  
# Troff document with MS macros  
application/x-troff-ms ms

```
LaTeX document
application/x-latex latex
Tex/LateX document
application/x-tex tex
GNU TexInfo document
application/x-texinfo texinfo texi
TeX dvi format
application/x-dvi dvi
MS word document
application/msword doc DOC
Office Document Architecture
application/oda oda
Envoy Document
application/envoy evy

ARCHIVE/COMPRESSED ARCHIVES

Gnu tar format
application/x-gtar gtar
4.3BSD tar format
application/x-tar tar
POSIX tar format
application/x-ustar ustar
Old CPIO format
application/x-bcpio bcpio
POSIX CPIO format
application/x-cpio cpio
UNIX sh shell archive
application/x-shar shar
DOS/PC - Pkzipped archive
application/zip zip
Macintosh Binhexed archive
application/mac-binhex40 hqx
Macintosh Stuffit Archive
application/x-stuffit sit sea
Fractal Image Format
application/fractals fif
"Binary UUencoded"
application/octet-stream bin uu
PC executable
application/octet-stream exe
"WAIS ""sources"""
application/x-wais-source src wsrc
NCSA HDF data format
application/hdf hdf

DOWNLOADABLE PROGRAM/SCRIPTS
```

# Javascript program  
text/javascript js ls mocha  
# UNIX bourne shell program  
application/x-sh sh  
# UNIX c-shell program  
application/x-csh csh  
# Perl program  
application/x-perl pl  
# Tcl (Tool Control Language) program  
application/x-tcl tcl

#### # ANIMATION/MULTIMEDIA

# FutureSplash vector animation (FutureWave)  
application/futuresplash spl  
# mBED multimedia data (mBED)  
application/mbedlet mbd  
# PowerMedia multimedia (RadMedia)  
application/x-rad-powermedia rad

#### # PRESENTATION

# PowerPoint presentation (Microsoft)  
application/mspowerpoint ppz  
# ASAP WordPower (Software Publishing Corp.)  
application/x-asap asp  
# Astound Web Player multimedia data (GoldDisk)  
application/astound asn

#### # SPECIAL EMBEDDED OBJECT

# OLE script e.g. Visual Basic (Ncompass)  
application/x-olescript axs  
# OLE Object (Microsoft/NCompass)  
application/x-oleobject ods  
# OpenScape OLE/OCX objects (Business@Web)  
x-form/x-openscape opp  
# Visual Basic objects (Amara)  
application/x-webbasic wba  
# Specialized data entry forms (Alpha Software)  
application/x-alpha-form frm  
# client-server objects (Wayfarer Communications)  
x-script/x-wfxclient wfx

#### # GENERAL APPLICATIONS

# Undefined binary data (often executable progs)  
application/octet-stream exe com

# Pointcast news data (Pointcast)  
application/x-pcn pcn  
# Excel spreadsheet (Microsoft)  
application/vnd.ms-excel xls  
# PowerPoint (Microsoft)  
application/vnd.ms-powerpoint ppt  
# Microsoft Project (Microsoft)  
application/vnd.ms-project mpp  
# SourceView document (Dataware Electronics)  
application/vnd.svd svd  
# Net Install - software install (20/20 Software)  
application/x-net-install ins  
# Carbon Copy - remote control/access (Microcom)  
application/ccv ccv  
# Spreadsheets (Visual Components)  
workbook/formulaone vts

#### # 2D/3D DATA/VIRTUAL REALITY TYPES

# VRML data file  
x-world/x-vrml wrl vrml  
# WIRL - VRML data (VREAM)  
x-world/x-vream vrw  
# Play3D 3d scene data (Play3D)  
application/x-p3d p3d  
# Viscape Interactive 3d world data (Superscape)  
x-world/x-svr svr  
# WebActive 3d data (Plastic Thought)  
x-world/x-wvr wvr  
# QuickDraw3D scene data (Apple)  
x-world/x-3dmf 3dmf

#### # SCIENTIFIC/MATH/CAD TYPES

# Mathematica notebook  
application/mathematica ma  
# Computational meshes for numerical simulations  
x-model/x-mesh msh  
# Vis5D 5-dimensional data  
application/vis5d v5d  
# IGES models -- CAD/CAM (CGM) data  
application/iges igs  
# Autocad WHIP vector drawings  
drawing/x-dwf dwf

Found in path(s):

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/mime.types

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Found in path(s):

```
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/MimeMessagePreparator.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/MailPreparationException.java
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Found in path(s):

```
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/MailAuthenticationException.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/transaction/AbstractTransactionSupportingCacheManager.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/DelegatingWork.java
```



\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/DelegatingTimerListener.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/DelegatingJob.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/MailParseException.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/JobMethodInvocationFailedException.java

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Found in path(s):

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/TimerManagerAccessor.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/MimeMailMessage.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/commonj/ScheduledTimerListener.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/javamail/SmartMimeMessage.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/MailException.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/transaction/TransactionAwareCacheManagerProxy.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/cache/ehcache/EhCacheManagerFactoryBean.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/ui/freemarker/FreeMarkerConfigurationFactoryBean.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/mail/MailMessage.java

\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/SchedulerAccessorBean.java

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 */
```

Found in path(s):

```
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/ui/freemarker/FreeMarkerConfigurationFactory.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/TimerManagerFactoryBean.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/AbstractFallbackJCacheOperationSource.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/CacheResultOperation.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/JCacheAspectSupport.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/DefaultJCacheOperationSource.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/DefaultCacheKeyInvocationContext.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/quartz/SpringBeanJobFactory.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/quartz/SchedulerFactoryBean.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/ConfigurableMimeFileTypeMap.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/MimeMessageHelper.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/commonj/TimerManagerTaskScheduler.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/SimpleExceptionCacheResolver.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/JCacheInterceptor.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
```

jar/org/springframework/cache/jcache/interceptor/AnnotationJCacheOperationSource.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/JCacheManagerFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/config/JCacheConfigurer.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/ehcache/EhCacheFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/SimpleTriggerFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CachePutOperation.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/DefaultCacheMethodDetails.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/LocalTaskExecutorThreadPool.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/JCacheOperationSourcePointcut.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/mail/javamail/JavaMailSenderImpl.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CacheResultInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/CronTriggerFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/SimpleThreadPoolTaskExecutor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/AbstractJCacheKeyOperation.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/BeanFactoryJCacheOperationSourceAdvisor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/DefaultCacheInvocationContext.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/mail/MailSendException.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/config/JCacheConfigurerSupport.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/AdaptableJobFactory.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CachePutInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/config/ProxyJCacheConfiguration.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/JobDetailFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/AbstractKeyCacheInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/JCacheOperationSource.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-

jar/org/springframework/cache/jcache/interceptor/CacheResolverAdapter.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/mail/SimpleMailMessage.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/ui/freemarker/SpringTemplateLoader.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/KeyGeneratorAdapter.java  
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\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/MethodInvokingJobDetailFactoryBean.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CacheRemoveOperation.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CacheRemoveAllInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/transaction/TransactionAwareCacheDecorator.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/CacheRemoveEntryInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/AbstractJCacheOperation.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/AbstractCacheInterceptor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/SchedulerAccessor.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/cache/jcache/interceptor/JCacheOperation.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/LocalDataSourceJobStore.java  
\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-  
jar/org/springframework/scheduling/quartz/ResourceLoaderClassLoadHelper.java

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* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/jcache/interceptor/CacheRemoveAllOperation.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/cache/ehcache/EhCacheManagerUtils.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/JavaMailSender.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/MailSender.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/mail/javamail/InternetAddressEditor.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/scheduling/quartz/QuartzJobBean.java
* /opt/cola/permits/1136838417_1613931142.36/0/spring-context-support-5-2-8-release-sources-
jar/org/springframework/ui/freemarker/FreeMarkerTemplateUtils.java
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\* /opt/cola/permits/1136838417\_1613931142.36/0/spring-context-support-5-2-8-release-sources-jar/org/springframework/scheduling/quartz/SchedulerContextAware.java

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## 1.242 springdoc-openapi-webmvc-core 1.5.9

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-----

Written by: Philip Hazel  
Email local part: ph10  
Email domain: cam.ac.uk

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## 1.244 spring-retry 1.2.5.RELEASE

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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/ExponentialRandomBackOffPolicy.java  
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/AnnotationAwareRetryOperationsInterceptor.java  
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```
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/classify/BinaryExceptionClassifier.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/policy/SimpleRetryPolicy.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/classify/SubclassClassifier.java
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jar/org/springframework/retry/annotation/CircuitBreaker.java
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/Backoff.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/EnableRetry.java  
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/StatisticsListener.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/DefaultStatisticsRepository.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/ExponentialAverageRetryStatistics.java  
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/DefaultRetryStatistics.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/StatisticsRepository.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/MutableRetryStatistics.java  
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/CircuitBreakerRetryPolicy.java

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  - \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/RetryConfiguration.java
  - \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/ThreadWaitSleeper.java
  - \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/Retryable.java
  - \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/interceptor/Retryable.java
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- \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/ExceptionClassifierRetryPolicy.java
- \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/AlwaysRetryPolicy.java
- \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/ExhaustedRetryException.java
- \* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/RetryCacheCapacityExceededException.java
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/annotation/Classifier.java

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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/RetryState.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/TerminatedRetryException.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/listener/RetryListenerSupport.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/Sleeper.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/BackOffContext.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/backoff/BackOffPolicy.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/policy/NeverRetryPolicy.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/RetryException.java  
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\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/RetryOperations.java  
\* /opt/cola/permits/1135864284\_1613618157.58/0/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/support/RetrySynchronizationManager.java  
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jar/org/springframework/retry/backoff/UniformRandomBackOffPolicy.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/context/RetryContextSupport.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/support/RetryTemplate.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/backoff/FixedBackOffPolicy.java
* /opt/cola/permits/1135864284_1613618157.58/0/spring-retry-1-2-5-release-sources-1-
jar/org/springframework/retry/backoff/ExponentialBackOffPolicy.java
```

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# 1.245 systemd 231

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```
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jar/org/springframework/scripting/support/StandardScriptUtils.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/jndi/JndiLocatorDelegate.java
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jar/org/springframework/scripting/groovy/GroovyObjectCustomizer.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/remoting/rmi/RmiClientInterceptorUtils.java
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jar/org/springframework/format/datetime/standard/TemporalAccessorPrinter.java
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jar/org/springframework/instrument/classloading/weblogic/WebLogicLoadTimeWeaver.java
* /opt/cola/permits/1135888116_1613626154.75/0/spring-context-5-2-8-release-sources-1-
jar/org/springframework/format/datetime/standard/TemporalAccessorParser.java
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scheduling/annotation/Schedules.java

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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/annotation/Cacheable.java  
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/cache/annotation/Caching.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/format/Parser.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/config/AbstractPropertyLoadingBeanDefinitionParser.java  
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/instrument/classloading/websphere/WebSphereClassPreDefinePlugin.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/ assembler/MetadataMBeanInfoAssembler.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/scripting/config/ScriptBeanDefinitionParser.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/annotation/EnableLoadTimeWeaving.java  
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jar/org/springframework/remoting/rmi/RmiRegistryFactoryBean.java  
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
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jar/org/springframework/cache/annotation/CachingConfigurationSelector.java  
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jar/org/springframework/ejb/access/LocalStatelessSessionProxyFactoryBean.java  
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
jar/org/springframework/validation/AbstractBindingResult.java  
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/\*\*

\* {@link FactoryBean} that obtains a WebSphere {@link javax.management.MBeanServer}

\* reference through WebSphere's proprietary {@code AdminServiceFactory} API,

\* available on WebSphere 5.1 and higher.

\*

\* <p>Exposes the {@code MBeanServer} for bean references.

\*

\* <p>This {@code FactoryBean} is a direct alternative to {@link MBeanServerFactoryBean},

\* which uses standard JMX 1.2 API to access the platform's {@link MBeanServer}.

\*

\* <p>See the javadocs for WebSphere's

\* <a

href="https://www.ibm.com/support/knowledgecenter/SSEQTJ\_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs/  
/com/ibm/websphere/management/AdminServiceFactory.html">{@code AdminServiceFactory}</a>

\* and

\* <a

href="https://www.ibm.com/support/knowledgecenter/SSEQTJ\_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs/  
/com/ibm/websphere/management/MBeanFactory.html">{@code MBeanFactory}</a>.

\*

\* @author Juergen Hoeller

\* @author Rob Harrop

\* @since 2.0.3

\* @see javax.management.MBeanServer

\* @see MBeanServerFactoryBean

\*/

Found in path(s):

\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/support/WebSphereMBeanServerFactoryBean.java

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- \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/jmx/export/MBeanExporterListener.java
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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-jar/org/springframework/context/i18n/SimpleLocaleContext.java

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/\*\*

\* Indicates that a component is only eligible for registration when all  
 \* { @linkplain #value specified conditions } match.  
 \*  
 \* <p>A <em>condition</em> is any state that can be determined programmatically  
 \* before the bean definition is due to be registered (see { @link Condition } for details).  
 \*  
 \* <p>The { @code @Conditional } annotation may be used in any of the following ways:  
 \* <ul>  
 \* <li>as a type-level annotation on any class directly or indirectly annotated with  
 \* { @code @Component }, including { @link Configuration @Configuration } classes</li>  
 \* <li>as a meta-annotation, for the purpose of composing custom stereotype  
 \* annotations</li>  
 \* <li>as a method-level annotation on any { @link Bean @Bean } method</li>  
 \* </ul>  
 \*  
 \* <p>If a { @code @Configuration } class is marked with { @code @Conditional },  
 \* all of the { @code @Bean } methods, { @link Import @Import } annotations, and  
 \* { @link ComponentScan @ComponentScan } annotations associated with that  
 \* class will be subject to the conditions.  
 \*  
 \* <p><strong>NOTE</strong>: Inheritance of { @code @Conditional } annotations  
 \* is not supported; any conditions from superclasses or from overridden  
 \* methods will not be considered. In order to enforce these semantics,  
 \* { @code @Conditional } itself is not declared as  
 \* { @link java.lang.annotation.Inherited @Inherited }; furthermore, any  
 \* custom <em>composed annotation</em> that is meta-annotated with  
 \* { @code @Conditional } must not be declared as { @code @Inherited }.  
 \*  
 \* @author Phillip Webb  
 \* @author Sam Brannen  
 \* @since 4.0  
 \* @see Condition  
 \*/

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/\*\*

\* Abstract the invocation of a cache operation.

\*

\* <p>Does not provide a way to transmit checked exceptions but

\* provide a special exception that should be used to wrap any

\* exception that was thrown by the underlying invocation.

\* Callers are expected to handle this issue type specifically.

\*

\* @author Stephane Nicoll

\* @since 4.1

\*/

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\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
jar/org/springframework/context/annotation/ClassPathBeanDefinitionScanner.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
jar/org/springframework/context/SmartLifecycle.java  
\* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
jar/org/springframework/ui/ConcurrentModel.java  
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jar/org/springframework/context/support/StaticApplicationContext.java  
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jar/org/springframework/context/support/BeanDefinitionDsl.kt  
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jar/org/springframework/context/event/ApplicationListenerMethodAdapter.java  
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jar/org/springframework/context/event/SimpleApplicationEventMulticaster.java  
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jar/org/springframework/context/ApplicationEventPublisher.java  
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jar/org/springframework/context/MessageSource.java  
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jar/org/springframework/context/annotation/AnnotationConfigRegistry.java  
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jar/org/springframework/format/datetime/standard/InstantFormatter.java  
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jar/org/springframework/context/support/ResourceBundleMessageSource.java  
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jar/org/springframework/context/event/EventListenerMethodProcessor.java  
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jar/org/springframework/context/ResourceLoaderAware.java  
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jar/org/springframework/cache/annotation/SpringCacheAnnotationParser.java  
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jar/org/springframework/cache/CacheManager.java  
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jar/org/springframework/context/support/GenericApplicationContext.java  
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jar/org/springframework/context/event/EventListener.java  
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jar/org/springframework/context/weaving/DefaultContextLoadTimeWeaver.java  
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jar/org/springframework/cache/support/AbstractCacheManager.java  
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jar/org/springframework/context/annotation/AnnotatedBeanDefinitionReader.java  
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jar/org/springframework/jndi/JndiTemplateEditor.java  
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jar/org/springframework/context/annotation/Import.java  
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jar/org/springframework/jmx/support/MBeanServerConnectionFactoryBean.java  
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jar/org/springframework/context/event/EventExpressionEvaluator.java  
 \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
 jar/org/springframework/cache/interceptor/CacheProxyFactoryBean.java  
 \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
 jar/org/springframework/cache/interceptor/CacheOperationSourcePointcut.java  
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 jar/org/springframework/jmx/support/MBeanServerFactoryBean.java  
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 jar/org/springframework/context/support/GenericApplicationContextExtensions.kt  
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 jar/org/springframework/cache/interceptor/CacheOperationSource.java  
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 jar/org/springframework/validation/ObjectError.java  
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 jar/org/springframework/context/ApplicationEvent.java  
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 jar/org/springframework/context/support/AbstractMessageSource.java  
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 jar/org/springframework/context/support/DefaultMessageSourceResolvable.java  
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 jar/org/springframework/context/annotation/ConfigurationClassUtils.java  
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 jar/org/springframework/cache/interceptor/AbstractCacheInvoker.java  
 \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
 jar/org/springframework/cache/annotation/AnnotationCacheOperationSource.java  
 \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
 jar/org/springframework/cache/annotation/CacheAnnotationParser.java  
 \* /opt/cola/permits/1135888116\_1613626154.75/0/spring-context-5-2-8-release-sources-1-  
 jar/org/springframework/cache/interceptor/CompositeCacheOperationSource.java

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man/strtoi.3bsd  
man/strtou.3bsd  
man/unvis.3bsd  
man/vis.3bsd  
man/wcslcpy.3bsd  
src/getbsize.c  
src/heapsort.c  
src/merge.c  
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man/closefrom.3bsd  
man/expand\_number.3bsd  
man/flopen.3bsd  
man/getpeereid.3bsd  
man/pidfile.3bsd  
src/expand\_number.c  
src/hash/sha512.h  
src/hash/sha512c.c  
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Files:

src/flopen.c

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man/readpassphrase.3bsd  
man/strncpy.3bsd  
man/strtonum.3bsd  
src/arc4random.c  
src/arc4random\_linux.h  
src/arc4random\_openbsd.h  
src/arc4random\_uniform.c  
src/arc4random\_unix.h  
src/arc4random\_win.h  
src/closefrom.c  
src/getentropy\_aix.c  
src/getentropy\_bsd.c  
src/getentropy\_hpux.c  
src/getentropy\_hurd.c  
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src/hash/md5.c

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src/chacha\_private.h

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\* @version 3.0 (December 2000)

\*

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\* @author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>

\* @author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>

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## 1.252 libdrm 2.4.45

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## 1.253 rrule 2.6.8

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rrule.js: Library for working with recurrence rules for calendar dates.

=====

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./rrule.js and ./test/tests.js is based on python-dateutil. LICENCE:

python-dateutil - Extensions to the standard Python datetime module.

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## 1.254 inotify-tools 3.14

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AverMedia fix and more flexible card recognition

Alan Cox <alan@lxorguk.ukuu.org.uk>  
Video4Linux interface and 2.1.x kernel adaptation

Chris Kleitsch  
Hardware I2C

Gerd Knorr <kraxel@cs.tu-berlin.de>  
Radio card (ITT sound processor)

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However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

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- b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

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```
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```

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/\* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)

\* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)

\*

\* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.

- \* <http://www.hypermall.com/>
- \* 10/1/97 - commented out CFG\_PHYIE bit - we don't care when the PHY
- \* interrupts us (except possibly for removal/insertion of the cable?)
- \* 10/4/97 - began heavy inline documentation of the code. Corrected typos
- \* and spelling mistakes.
- \* 10/5/97 - added code to handle PHY interrupts, disable PHY on
- \* loss of link, and correctly re-enable PHY when link is
- \* re-established. (put back CFG\_PHYIE)
- \*
- \* Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
- \*
- \* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
- \*
- \* Linux driver for the IDT77201 NICStAR PCI ATM controller.
- \* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
- \* see init\_nicstar() for PHY initialization to change this. This driver
- \* expects the Linux ATM stack to support scatter-gather lists
- \* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
- \*
- \* Implementing minimal-copy of received data:
- \* IDT always receives data into a small buffer, then large buffers
- \* as needed. This means that data must always be copied to create
- \* the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
- \* Fix is simple: make large buffers large enough to hold entire
- \* SDU, and leave <small\_buffer\_data> bytes empty at the start. Then
- \* copy small buffer contents to head of large buffer.
- \* Trick is to avoid fragmenting Linux, due to need for a lot of large
- \* buffers. This is done by 2 things:
- \* 1) skb->destructor / skb->atm.recycle\_buffer
- \* combined, allow nicstar\_free\_rx\_skb to be called to
- \* recycle large data buffers
- \* 2) skb\_clone of received buffers
- \* See nicstar\_free\_rx\_skb and linearize\_buffer for implementation
- \* details.
- \*
- \*
- \*
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\*  
\* M. Welsh, 6 July 1996

\*  
\*  
\*/

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for his contributions to the dvb-net driver

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for CyberLogin for Linux which allows logging onto EON  
(in case you are wondering where CyberLogin is, EON changed its login  
procedure and CyberLogin is no longer used.)

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Andreas Oberritter <obi@linuxtv.org>

Dennis Noermann <dennis.noermann@noernet.de>

Felix Domke <tmbinc@elitedvb.net>

Florian Schirmer <jolt@tuxbox.org>

Ronny Strutz <3des@elitedvb.de>

Wolfram Joost <dbox2@frokaschwei.de>

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for the IR code for the ttusb-dec driver

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for the nxt2004 frontend driver

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for the or51211 and or51132 frontend drivers, and  
for merging the nxt2002 and nxt2004 modules into a  
single nxt200x frontend driver.

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/RequestVariablesExtractor.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/firewall/StrictHttpFirewall.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/servlet/util/matcher/MvcRequestMatcher.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/DelegatingAuthenticationEntryPoint.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/ELRequestMatcher.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/RequestMatcherEditor.java

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- \* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authorization/AuthorizationContext.java
- \* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authorization/AuthorizationWebFilter.java
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- \* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/header/ContentTypeOptionsServerHttpHeadersWriter.java
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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/header/writers/ContentSecurityPolicyHeaderWriter.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/LazyCsrfTokenRepository.java  
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jar/org/springframework/security/web/server/jackson2/DefaultCsrfServerTokenMixin.java
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- \* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/WebExpressionConfigAttribute.java
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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/SimpleRedirectInvalidSessionStrategy.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/header/writers/frameoptions/StaticAllowFromStrategy.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/context/request/async/WebAsyncManagerIntegrationFilter.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/logout/HttpStatusReturningLogoutSuccessHandler.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/preauth/PreAuthenticatedGrantedAuthoritiesWebAuthenticationDetails.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/preauth/RequestAttributeAuthenticationFilter.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/header/writers/frameoptions/AllowFromStrategy.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/package-info.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/WebExpressionVoter.java  
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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/EvaluationContextPostProcessor.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/AbstractVariableEvaluationContextPostProcessor.java  
\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/DelegatingAccessDeniedHandler.java  
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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/csrf/CsrfWebFilter.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/InvalidSessionAccessDeniedHandler.java

\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/HttpSessionCsrfTokenRepository.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/session/ChangeSessionIdAuthenticationStrategy.java

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\* /opt/ws\_local/PERMITS\_SQL/1081949352\_1599626384.45/0/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/bind/support/AuthenticationPrincipalArgumentResolver.java

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java
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* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/body-
pix.esm.js
```

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Found in path(s):

```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/util_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/util_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/body_pix_test.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/single_person/argmax2d_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/body_pix_test.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/single_person/argmax2d_test.d.ts
```

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\*/

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- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/keypoints.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/decode\_pose.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/version\_test.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/blur.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/decode\_part\_map.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/util.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/setup\_test.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/version\_test.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/util.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single\_person/decode\_single\_pose.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/build\_part\_with\_score\_queue.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/setup\_test.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single\_person/argmax2d.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single\_person/util.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/output\_rendering\_util.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single\_person/util.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/single\_person/argmax2d.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/output\_rendering\_util.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/build\_part\_with\_score\_queue.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/decode\_pose.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/blur.d.ts
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/keypoints.js

```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/decode_part_map.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/run_tests.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/single_person/decode_single_pose.js
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```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/saved_models.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/saved_models.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/index.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/resnet.d.ts
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/index.js
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-
pix/dist/resnet.js
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```
{"version":3,"file":"body-
pix.min.js","sources":["../src/decode_part_map.ts","../src/base_model.ts","../src/mobilenet.ts","../src/keypoints.ts","..
../src/multi_person/util.ts","../src/multi_person/decode_multiple_masks_cpu.ts","../src/multi_person/decode_multiple
_masks_webgl.ts","../src/multi_person/decode_instance_masks.ts","../src/multi_person/max_heap.ts","../src/multi_p
erson/build_part_with_score_queue.ts","../src/multi_person/decode_pose.ts","../src/multi_person/decode_multiple_p
oses.ts","../src/resnet.ts","../src/saved_models.ts","../src/util.ts","../src/body_pix_model.ts","../src/output_rendering_
util.ts","../src/blur.ts","../src/part_channels.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright
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```
=====
import * as tf from 'tensorflow/tfjs-core';

/**
 * Takes the sigmoid of the part heatmap output and
 * generates a 2d one-hot tensor with ones where the part's score has the maximum value.
 * @param
 * partHeatmapScores A 3d-tensor of the sigmoid of the part heatmap output.
 * @returns A 2d one-hot tensor with ones where the part's score has the maximum value.
 */
function toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
 const numParts = partHeatmapScores.shape[2];
 const partMapLocations = tf.argmax(partHeatmapScores, 2);
 const partMapFlattened = tf.reshape(partMapLocations, [-1]);
 return tf.oneHot(partMapFlattened, numParts) as tf.Tensor2D;
}

/**
 * Takes the sigmoid of the segmentation output, and generates a segmentation
 * mask with a 1 or 0 at each pixel where there is a person or not a person. The
 * segmentation threshold determines the threshold of a score for a pixel for it
 * to be considered part of a person.
 * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.
 * @param segmentationThreshold The minimum that
 * segmentation values must have to be considered part of the person. Affects the generation of the
 * segmentation mask and the clipping of the colored part image.
 * @returns A segmentation mask with a 1 or 0
 * at each pixel where there is a person or not a person.
 */
function toMaskTensor(segmentScores: tf.Tensor2D, threshold: number): tf.Tensor2D {
 return tf.tidy(() => (tf.cast(tf.greater(segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));
}

/**
 * Takes the sigmoid of the person and
 * part map output, and returns a 2d tensor of an image with the corresponding value at each pixel corresponding to
 * the part with the highest value. These part ids are clipped by the segmentation
 * mask. Wherever the a pixel is
 * clipped by the segmentation mask, its value will set to -1, indicating that there is no part in that pixel.
 * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.
 * @param partHeatmapScores A 3d-tensor of the sigmoid of the part heatmap output. The third dimension corresponds to the part.
 * @returns A 2d tensor of an image with the corresponding value at each pixel corresponding to the part with the
 * highest value. These part ids are clipped by the segmentation mask. It will have values of -1 for pixels that are
 * outside of the body and do not have a corresponding part.
 */
function decodePartSegmentation(segmentationMask: tf.Tensor2D, partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
 const [partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;
 return tf.tidy(() => {
 const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);
 const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);
 const partMapFlattened = tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');
 const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);
 const partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));
 return tf.sub(clipByMask2d(partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask), tf.scalar(1, 'int32'));
 });
}

/**
 * Takes the sigmoid of the person and
 * part map output, and returns a 2d tensor of an image with the corresponding value at each pixel corresponding to
 * the part with the highest value. These part ids are clipped by the segmentation
 * mask. Wherever the a pixel is
 * clipped by the segmentation mask, its value will set to -1, indicating that there is no part in that pixel.
 * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.
 * @param partHeatmapScores A 3d-tensor of the sigmoid of the part heatmap output. The third dimension corresponds to the part.
 * @returns A 2d tensor of an image with the corresponding value at each pixel corresponding to the part with the
 * highest value. These part ids are clipped by the segmentation mask. It will have values of -1 for pixels that are
 * outside of the body and do not have a corresponding part.
 */
function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
 const [partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;
 return tf.tidy(() => {
 const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);
 const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);
 const partMapFlattened = tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');
 return tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);
 });
}

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```

=====
*/
import * as tfconv from '@tensorflow/tfjs-converter';
import * as tf from '@tensorflow/tfjs-core';
import {BodyPixOutputStride} from './types';
/**
 * BodyPix supports using various convolution neural network
 * models (e.g. ResNet and MobileNetV1) as its underlying base model.
 * The following BaseModel interface defines a unified interface for
 * creating such BodyPix base models. Currently both MobileNet (in
 * ./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel
 * interface. New base models that conform to the BaseModel interface
 * can be added to BodyPix.
 */
export abstract class BaseModel {
 constructor(protected readonly model: tfconv.GraphModel,
 public readonly outputStride: BodyPixOutputStride) {
 const inputShape = this.model.inputs[0].shape as [number, number, number, number];
 tf.util.assert((inputShape[1] === -1) && (inputShape[2] === -1),
 () => `Input shape [${inputShape[1]}, ${inputShape[2]}]
 must both be equal to or -1`);
 }
 abstract preprocessInput(input: tf.Tensor3D): tf.Tensor3D;
 /**
 * Predicts intermediate Tensor representations.
 * @param input The input RGB image of the base model.
 * A Tensor of shape: [inputResolution, inputResolution, 3].
 * @return A dictionary of base model's intermediate predictions.
 * The returned dictionary should contains the following elements:
 * - heatmapScores: A Tensor3D that represents the keypoint heatmap scores.
 * - offsets: A Tensor3D that represents the offsets.
 * - displacementFwd: A Tensor3D that represents the forward displacement.
 * - displacementBwd: A Tensor3D that represents the backward displacement.
 * - segmentation: A Tensor3D that represents the segmentation of all
 * people.
 * - longOffsets: A Tensor3D that represents the long offsets used
 for instance grouping.
 * - partHeatmaps: A Tensor3D that represents the body part segmentation.
 */
 abstract predict(input: tf.Tensor3D): {
 heatmapScores: tf.Tensor3D,
 offsets: tf.Tensor3D,
 displacementFwd: tf.Tensor3D,
 displacementBwd: tf.Tensor3D,
 segmentation: tf.Tensor3D,
 partHeatmaps: tf.Tensor3D,
 longOffsets: tf.Tensor3D,
 partOffsets: tf.Tensor3D
 }
 return tf.tidy(() => {
 const asFloat = this.preprocessInput(tf.cast(input, 'float32'));
 const asBatch = tf.expandDims(asFloat, 0);
 const results = this.model.predict(asBatch) as tf.Tensor4D[];
 const results3d: tf.Tensor3D[] = results.map(y => tf.squeeze(y, [0]));
 const namedResults = this.nameOutputResults(results3d);
 return {
 heatmapScores: tf.sigmoid(namedResults.heatmap),
 offsets: namedResults.offsets,
 displacementFwd: namedResults.displacementFwd,
 displacementBwd: namedResults.displacementBwd,
 segmentation: namedResults.segmentation,
 partHeatmaps: namedResults.partHeatmaps,
 longOffsets: namedResults.longOffsets,
 partOffsets: namedResults.partOffsets
 };
 });
}
// Because MobileNet and ResNet predict() methods output a different order
// for these values, we have a method that needs to be implemented to
// order them.
abstract nameOutputResults(results: tf.Tensor3D[]): {
 heatmap: tf.Tensor3D,
 offsets: tf.Tensor3D,
 displacementFwd: tf.Tensor3D,
 displacementBwd: tf.Tensor3D,
 segmentation: tf.Tensor3D,
 partHeatmaps: tf.Tensor3D,
 longOffsets: tf.Tensor3D,
 partOffsets: tf.Tensor3D
};
/**
 * Releases the CPU and GPU memory allocated by the model.
 */
dispose() {
 this.model.dispose();
}
}
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=====
*/
import * as tf from '@tensorflow/tfjs-core';
import {BaseModel} from './base_model';
export class MobileNet extends BaseModel {
 preprocessInput(input: tf.Tensor3D): tf.Tensor3D {
 // Normalize the pixels [0, 255] to be between [-1, 1].
 return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));
 }
 nameOutputResults(results: tf.Tensor3D[]) {
 const [offsets, segmentation, partHeatmaps, longOffsets, heatmap, displacementFwd, displacementBwd, partOffsets] = results;
 return [offsets, segmentation, partHeatmaps, longOffsets, heatmap, displacementFwd, displacementBwd, partOffsets];
 }
}

```



displacementFwd,\n displacementBwd,\n partOffsets\n };\n }\n}", "/\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple = Tuple<number>;\nexport const PART_NAMES = [\n 'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',\n 'leftShoulder',\n 'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n 'leftHip', 'rightHip', 'leftKnee', 'rightKnee', 'leftAnkle', 'rightAnkle'\n];\nexport const NUM_KEYPOINTS = PART_NAMES.length;\nexport interface NumberDict {\n [jointName: string]: number;\n}\nexport const PART_IDS =\nPART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n result[jointName] = i;\n return result;\n }, {});\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n ['leftHip', 'leftShoulder'],\n ['leftElbow', 'leftShoulder'],\n ['leftElbow', 'leftWrist'],\n ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'],\n ['rightHip', 'rightShoulder'],\n ['rightElbow', 'rightShoulder'],\n ['rightElbow', 'rightWrist'],\n ['rightHip', 'rightKnee'],\n ['rightKnee', 'rightAnkle'],\n ['leftShoulder', 'rightShoulder'],\n ['leftHip', 'rightHip']\n];\n\n/* Define the skeleton. This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree, however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the tree root as any node.\n */\nexport const POSE_CHAIN: StringTuple[] = [\n 'nose', 'leftEye', ['leftEye', 'leftEar'],\n ['nose', 'rightEye'],\n ['rightEye', 'rightEar'],\n ['nose', 'leftShoulder'],\n ['leftShoulder', 'leftElbow'],\n ['leftElbow', 'leftWrist'],\n ['leftShoulder', 'leftHip'],\n ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'],\n ['nose', 'rightShoulder'],\n ['rightShoulder', 'rightElbow'],\n ['rightElbow', 'rightWrist'],\n ['rightShoulder', 'rightHip'],\n ['rightHip', 'rightKnee'],\n ['rightKnee', 'rightAnkle']\n];\nexport const CONNECTED_PART_INDICES =\nCONNECTED_PART_NAMES.map(([jointNameA, jointNameB]) => (\n [PART_IDS[jointNameA], PART_IDS[jointNameB]]\n));\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from './types';\nexport function getScale(\n [height, width]: [number, number],\n [inputResolutionY, inputResolutionX]: [number, number],\n padding: Padding): [number, number] {\n const {top: padT, bottom: padB, left: padL, right: padR} = padding;\n const scaleY = inputResolutionY / (padT + padB + height);\n const scaleX = inputResolutionX / (padL + padR + width);\n return [scaleX, scaleY];\n}\n\nexport function getOffsetPoint(\n y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n return {\n y: offsets.get(y, x, keypoint),\n x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n };\n}\n\nexport function getImageCoords(\n part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n const {heatmapY, heatmapX, id: keypoint} = part;\n const {y, x} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n return {\n x: part.heatmapX * outputStride + x,\n y: part.heatmapY * outputStride + y\n };\n}\n\nexport function fillArray<T>(element: T, size: number): T[] {\n const result: T[] = new Array(size);\n for (let i = 0; i < size; i++) {\n result[i] = element;\n }\n return result;\n}\n\nexport function clamp(a: number, min: number, max: number): number {\n if (a < min) {\n return min;\n }\n if (a > max) {\n return max;\n }\n return a;\n}\n\nexport function squaredDistance(\n y1: number, x1: number, y2: number, x2: number): number {\n const
```

```

dy = y2 - y1;\n const dx = x2 - x1;\n return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b:
Vector2D): Vector2D {\n return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min:
number, max: number): Vector2D {\n return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n\n"/**\n *
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```

```

=====
*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport
{getScale} from './util';\n\ninterface Pair {\n x: number;\n y: number;\n}\n\nfunction computeDistance(embedding:
Pair[], pose: Pose, minPartScore = 0.3) {\n let distance = 0.0;\n let numKpt = 0;\n for (let p = 0; p <
embedding.length; p++) {\n if (pose.keypoints[p].score > minPartScore) {\n numKpt += 1;\n distance +=
(embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n (embedding[p].y - pose.keypoints[p].position.y) **
2;\n }\n }\n if (numKpt === 0) {\n distance = Infinity;\n } else {\n distance = distance / numKpt;\n }\n
return distance;\n}\n\nfunction convertToPositionInOutput(\n position: Pair, [padT, padL]: [number, number],\n [scaleX, scaleY]: [number, number], stride: number): Pair {\n const y = Math.round(((padT + position.y + 1.0) *
scaleY - 1.0) / stride);\n const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n return {x,
y};\n}\n\nfunction getEmbedding(\n location: Pair, keypointIndex: number,\n convertToPosition: (pair: Pair) =>
Pair, outputResolutionX: number,\n longOffsets: Float32Array, refineSteps: number,\n [height, width]: [number,
number]): Pair {\n const newLocation = convertToPosition(location);\n const nn = newLocation.y *
outputResolutionX + newLocation.x;\n let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n let
dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n let y = location.y + dy;\n let x =
location.x + dx;\n for (let t = 0; t < refineSteps; t++) {\n y = Math.min(y, height - 1);\n x = Math.min(x, width -
1);\n const newPos = convertToPosition({x, y});\n const nn = newPos.y * outputResolutionX + newPos.x;\n
dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n dx = longOffsets[NUM_KEYPOINTS * (2 *
nn + 1) + keypointIndex];\n y = y + dy;\n x = x + dx;\n }\n\n return {x, y};\n}\n\nfunction
matchEmbeddingToInstance(\n location: Pair, longOffsets: Float32Array, poses: Pose[],\n numKptForMatching:
number, [padT, padL]: [number, number],\n [scaleX, scaleY]: [number, number], outputResolutionX: number,\n [height, width]: [number, number], stride: number,\n refineSteps: number): number {\n const embed: Pair[] = [];\n
const convertToPosition = (pair: Pair) =>\n convertToPositionInOutput(pair, [padT, padL], [scaleX, scaleY],
stride);\n\n for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;\n keypointsIndex++) {\n
const embedding = getEmbedding(\n location, keypointsIndex, convertToPosition, outputResolutionX,\n
longOffsets, refineSteps, [height, width]);\n embed.push(embedding);\n }\n\n let kMin = -1;\n let kMinDist =
Infinity;\n for (let k = 0; k < poses.length; k++) {\n const dist = computeDistance(embed, poses[k]);\n if (dist <
kMinDist) {\n kMin = k;\n kMinDist = dist;\n }\n }\n return kMin;\n}\n\nfunction getOutputResolution(\n
[inputResolutionY, inputResolutionX]: [number, number],\n stride: number): [number, number] {\n const
outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n const outputResolutionY =
Math.round((inputResolutionY - 1.0) / stride + 1.0);\n return [outputResolutionX, outputResolutionY];\n}\n\nexport
function decodeMultipleMasksCPU(\n segmentation: Uint8Array, longOffsets: Float32Array,\n
posesAboveScore: Pose[], height: number, width: number, stride: number,\n [inHeight, inWidth]: [number,
number], padding: Padding,\n refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n const dataArrays
=\n posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n\n const {top: padT, left: padL} =
padding;\n\n const [scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n const
[outputResolutionX,] =\n getOutputResolution([inHeight, inWidth], stride);\n for (let i = 0; i < height; i += 1) {\n
for (let j = 0; j < width; j += 1) {\n const n = i * width + j;\n const prob = segmentation[n];\n if (prob ===
1) {\n const kMin = matchEmbeddingToInstance(\n {x: j, y: i}, longOffsets, posesAboveScore,

```

```

numKptForMatching,\n [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n stride,
refineSteps);\n if (kMin >= 0) {\n dataArrays[kMin][n] = 1;\n }\n}\n}\n}\n}\n}\n\n return
dataArrays;\n}\n}\n\nexport function decodeMultiplePartMasksCPU(\n segmentation: Uint8Array, longOffsets:
Float32Array,\n partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,\n width: number,
stride: number, [inHeight, inWidth]: [number, number],\n padding: Padding, refineSteps: number,\n numKptForMatching = 5): Int32Array[] {\n const dataArrays =\n posesAboveScore.map(x => new
Int32Array(height * width).fill(-1));\n\n const {top: padT, left: padL} = padding;\n\n const [scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n const [outputResolutionX,] =\n getOutputResolution([inHeight, inWidth], stride);\n\n for (let i = 0; i < height; i += 1) {\n for (let j = 0; j < width; j
+= 1) {\n const n = i * width + j;\n const prob = segmentation[n];\n if (prob === 1) {\n const kMin =
matchEmbeddingToInstance(\n {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,\n [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n stride, refineSteps);\n if (kMin >=
0) {\n dataArrays[kMin][n] = partSegmentaion[n];\n }\n }\n }\n }\n\n return
dataArrays;\n}\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-
webgl';\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\nimport
{getScale} from './util';\n\nexport function decodeMultipleMasksWebGl(\n segmentation: tf.Tensor2D,
longOffsets: tf.Tensor3D,\n posesAboveScore: Pose[], height: number, width: number, stride: number,\n
[inHeight, inWidth]: [number, number], padding: Padding,\n refineSteps: number, minKptScore: number,\n
maxNumPeople: number): tf.TensorInfo {\n // The height/width of the image/canvas itself.\n const [origHeight,
origWidth] = segmentation.shape;\n // The height/width of the output of the model.\n const [outHeight, outWidth]
= longOffsets.shape.slice(0, 2);\n\n const shapedLongOffsets: tf.Tensor4D =\n tf.reshape(longOffsets,
[outHeight, outWidth, 2, NUM_KEYPOINTS]);\n\n // Make pose tensor of shape [MAX_NUM_PEOPLE,
NUM_KEYPOINTS, 3] where\n // the last 3 coordinates correspond to the score, h and w coordinate of that\n //
keypoint.\n const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i =
0; i < posesAboveScore.length; i++) {\n const poseOffset = i * NUM_KEYPOINTS * 3;\n const pose =
posesAboveScore[i];\n for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n const keypoint =
pose.keypoints[kp];\n const offset = poseOffset + kp * 3;\n poseVals[offset] = keypoint.score;\n
 poseVals[offset + 1] = keypoint.position.y;\n poseVals[offset + 2] = keypoint.position.x;\n }\n }\n\n const
[scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n\n const posesTensor =
tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n\n const {top: padT, left: padL} = padding;\n\n const program: tf_webgl.GPGPUProgram = {\n variableNames: ['segmentation', 'longOffsets', 'poses'],\n
 outputShape: [origHeight, origWidth],\n userCode: `\n int convertToPositionInOutput(int pos, int pad, float
scale, int stride) {\n return round(((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n }\n\n float
convertToPositionInOutputFloat(\n int pos, int pad, float scale, int stride) {\n return ((float(pos + pad) + 1.0)
* scale - 1.0) / float(stride);\n }\n\n float dist(float x1, float y1, float x2, float y2) {\n return pow(x1 - x2, 2.0)
+ pow(y1 - y2, 2.0);\n }\n\n float sampleLongOffsets(float h, float w, int d, int k) {\n float fh = fract(h);\n
 float fw = fract(w);\n int clH = int(ceil(h));\n int clW = int(ceil(w));\n int flH = int(floor(h));\n int flW =
int(floor(w));\n float o11 = getLongOffsets(flH, flW, d, k);\n float o12 = getLongOffsets(flH, clW, d, k);\n
 float o21 = getLongOffsets(clH, flW, d, k);\n float o22 = getLongOffsets(clH, clW, d, k);\n float o1 =
mix(o11, o12, fw);\n float o2 = mix(o21, o22, fw);\n return mix(o1, o2, fh);\n }\n\n int

```

```

findNearestPose(int h, int w) {
 float prob = getSegmentation(h, w);
 if (prob < 1.0) {
 return -1;
 }
 // Done(Tyler): convert from output space h/w to strided space.
 float stridedH =
 convertToPositionInOutFloat(h, ${padT}, ${scaleY}, ${stride});
 float stridedW =
 convertToPositionInOutFloat(w, ${padL}, ${scaleX}, ${stride});
 float minDist = 1000000.0;
 int iMin = -1;
 for (int i = 0; i < ${maxNumPeople}; i++) {
 float curDistSum = 0.0;
 int numKpt = 0;
 for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {
 float dy = sampleLongOffsets(stridedH, stridedW, 0, k);
 float dx = sampleLongOffsets(stridedH, stridedW, 1, k);
 float y = float(h) + dy;
 float x = float(w) + dx;
 for (int s = 0; s < ${refineSteps}; s++) {
 int yRounded = round(min(y, float(${height} - 1.0)));
 int xRounded = round(min(x, float(${width} - 1.0)));
 float yStrided =
 convertToPositionInOutFloat(yRounded, ${padT}, ${scaleY}, ${stride});
 float xStrided =
 convertToPositionInOutFloat(xRounded, ${padL}, ${scaleX}, ${stride});
 float dy =
 sampleLongOffsets(yStrided, xStrided, 0, k);
 float dx = sampleLongOffsets(yStrided, xStrided, 1, k);
 y = y + dy;
 x = x + dx;
 }
 float poseScore = getPoses(i, k, 0);
 float poseY =
 getPoses(i, k, 1);
 float poseX =
 getPoses(i, k, 2);
 if (poseScore > ${minKptScore}) {
 numKpt = numKpt + 1;
 curDistSum = curDistSum + dist(x, y, poseX, poseY);
 }
 }
 if (numKpt > 0 && curDistSum / float(numKpt) < minDist) {
 minDist = curDistSum / float(numKpt);
 iMin = i;
 }
 }
 return iMin;
}

void main() {
 ivec2 coords = getOutputCoords();
 int nearestPose = findNearestPose(coords[0], coords[1]);
 setOutput(float(nearestPose));
}

const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;
return webglBackend.compileAndRun(
 program, [segmentation, shapedLongOffsets, posesTensor]);
}

/*
=====
* \n \n import * as tf from '@tensorflow/tfjs-core';
* \n \n import {getBackend} from '@tensorflow/tfjs-core';
* \n \n import {Padding, PartSegmentation, PersonSegmentation, Pose} from './types';
* \n \n import {decodeMultipleMasksCPU, decodeMultiplePartMasksCPU} from './decode_multiple_masks_cpu';
* \n \n import {decodeMultipleMasksWebGL} from './decode_multiple_masks_webgl';
* \n \n export function toPersonKSegmentation(
 segmentation: tf.Tensor2D, k: number): tf.Tensor2D {
 return tf.tidy(() => (tf.cast(tf.equal(
 segmentation, tf.scalar(k)), 'int32') as tf.Tensor2D));
}

* \n \n export function toPersonKPartSegmentation(
 segmentation: tf.Tensor2D, bodyParts: tf.Tensor2D, k: number): tf.Tensor2D {
 return tf.tidy(() => tf.sub(tf.mul(tf.cast(tf.equal(
 segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));
}

* \n \n function isWebGLBackend() {
 return getBackend() === 'webgl';
}

* \n \n export async function decodePersonInstanceMasks(
 segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],
 height: number, width: number, stride: number, [inHeight, inWidth]: [number, number],
 padding: Padding, minPoseScore = 0.2, refineSteps = 8, minKeypointScore = 0.3,
 maxNumPeople = 10): Promise<PersonSegmentation[]> {
 // Filter out poses with smaller score.
 const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);
 let personSegmentationsData: Uint8Array[];
 if (isWebGLBackend()) {
 const personSegmentations = tf.tidy(() => {
 const masksTensorInfo = decodeMultipleMasksWebGL(
 segmentation, longOffsets, posesAboveScore, height, width, stride,
 [inHeight, inWidth], padding, refineSteps, minKeypointScore, maxNumPeople);
 const masksTensor = tf.engine().makeTensorFromDataId(
 masksTensorInfo.dataId, masksTensorInfo.shape, masksTensorInfo.dtype) as tf.Tensor2D;
 return posesAboveScore.map((_, k) => toPersonKSegmentation(masksTensor, k));
 });
 personSegmentationsData = (await Promise.all(personSegmentations.map(mask => mask.data()))) as Uint8Array[];
 } else {
 const segmentationsData = await

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segmentation.data() as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n\n personSegmentationsData = decodeMultipleMasksCPU(\n segmentationsData, longOffsetsData,\n posesAboveScore, height, width,\n stride, [inHeight, inWidth], padding, refineSteps);\n }\n\n return\n personSegmentationsData.map(\n (data, i) => ({data, pose: posesAboveScore[i], width, height});\n);\n\n export\n async function decodePersonInstancePartMasks(\n segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D,\n partSegmentation: tf.Tensor2D, poses: Pose[], height: number, width: number,\n stride: number, [inHeight,\n inWidth]: [number, number], padding: Padding,\n minPoseScore = 0.2, refineSteps = 8, minKeypointScore =\n 0.3,\n maxNumPeople = 10): Promise<PartSegmentation[]> {\n const posesAboveScore = poses.filter(pose =>\n pose.score >= minPoseScore);\n\n let partSegmentationsByPersonData: Int32Array[];\n\n if (isWebGLBackend())\n {\n const partSegmentations = tf.tidy(() => {\n const masksTensorInfo = decodeMultipleMasksWebGL(\n segmentation, longOffsets, posesAboveScore, height, width, stride,\n [inHeight, inWidth], padding,\n refineSteps, minKeypointScore,\n maxNumPeople);\n const masksTensor =\n tf.engine().makeTensorFromDataId(\n masksTensorInfo.dataId, masksTensorInfo.shape,\n masksTensorInfo.dtype) as tf.Tensor2D;\n\n return posesAboveScore.map(\n (_, k) =>{\n toPersonKPartSegmentation(masksTensor, partSegmentation, k);\n });\n });\n partSegmentationsByPersonData =\n (await Promise.all(partSegmentations.map(x => x.data()))) as\n Int32Array[];\n }\n\n partSegmentations.forEach(x => x.dispose());\n } else {\n const segmentationsData = await segmentation.data()\n as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n const\n partSegmentaionData = await partSegmentation.data() as Uint8Array;\n\n partSegmentationsByPersonData =\n decodeMultiplePartMasksCPU(\n segmentationsData, longOffsetsData, partSegmentaionData,\n posesAboveScore, height, width, stride, [inHeight, inWidth], padding,\n refineSteps);\n }\n\n return\n partSegmentationsByPersonData.map(\n (data, k) => ({pose: posesAboveScore[k], data, height,\n width});\n);\n\n };\n\n /**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

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=====\n
*\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n\n//\n\nhttps://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n return\n Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n private priorityQueue: T[];\n private numberOfElements:\n number;\n private getElementValue: (element: T) => number;\n\n constructor(maxSize: number, getElementValue:\n (element: T) => number) {\n this.priorityQueue = new Array(maxSize);\n this.numberOfElements = -1;\n this.getElementValue = getElementValue;\n }\n\n public enqueue(x: T): void {\n this.priorityQueue[++this.numberOfElements] = x;\n this.swim(this.numberOfElements);\n }\n\n public\n dequeue(): T {\n const max = this.priorityQueue[0];\n this.exchange(0, this.numberOfElements--);\n this.sink(0);\n this.priorityQueue[this.numberOfElements + 1] = null;\n return max;\n }\n\n public empty():\n boolean {\n return this.numberOfElements === -1;\n }\n\n public size(): number {\n return\n this.numberOfElements + 1;\n }\n\n public all(): T[] {\n return this.priorityQueue.slice(0, this.numberOfElements\n + 1);\n }\n\n public max(): T {\n return this.priorityQueue[0];\n }\n\n private swim(k: number): void {\n while\n (k > 0 && this.less(half(k), k)) {\n this.exchange(k, half(k));\n k = half(k);\n }\n }\n\n private sink(k:\n number): void {\n while (2 * k <= this.numberOfElements) {\n let j = 2 * k;\n if (j < this.numberOfElements\n && this.less(j, j + 1)) {\n j++;\n }\n if (!this.less(k, j)) {\n break;\n }\n this.exchange(k, j);\n k = j;\n }\n }\n\n private getValueAt(i: number): number {\n return\n this.getElementValue(this.priorityQueue[i]);\n }\n\n private less(i: number, j: number): boolean {\n return\n this.getValueAt(i) < this.getValueAt(j);\n }\n\n private exchange(i: number, j: number): void {\n const t =

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this.priorityQueue[i];\n this.priorityQueue[i] = this.priorityQueue[j];\n this.priorityQueue[j] = t;\n }\n }", "/\*\*\n \* @license\n \* Copyright 2019 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nimport {PartWithScore, TensorBuffer3D} from './types';\nimport {MaxHeap} from './max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n keypointId: number, score: number, heatmapY: number, heatmapX: number,\n localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n const [height, width] = scores.shape;\n let localMaximum = true;\n const yStart = Math.max(heatmapY - localMaximumRadius, 0);\n const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n for (let yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n const xStart = Math.max(heatmapX - localMaximumRadius, 0);\n const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n for (let xCurrent = xStart; xCurrent < xEnd; ++xCurrent) {\n if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n localMaximum = false;\n break;\n }\n }\n if (!localMaximum) {\n break;\n }\n }\n return localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a single priority queue across all parts.\n */\nexport function buildPartWithScoreQueue(\n scoreThreshold: number, localMaximumRadius: number, scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n const [height, width, numKeypoints] = scores.shape;\n const queue = new MaxHeap<PartWithScore>(\n height * width * numKeypoints, ({score}) => score);\n for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n for (let heatmapX = 0; heatmapX < width; ++heatmapX) {\n for (let keypointId = 0; keypointId < numKeypoints; ++keypointId) {\n const score = scores.get(heatmapY, heatmapX, keypointId);\n // Only consider parts with score greater or equal to threshold as\n // root candidates.\n if (score < scoreThreshold) {\n continue;\n }\n // Only consider keypoints whose score is maximum in a local window.\n if (scoreIsMaximumInLocalWindow(\n keypointId, score, heatmapY, heatmapX, localMaximumRadius, scores)) {\n queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n }\n }\n }\n }\n return queue;\n}\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';\nimport {Keypoint, PartWithScore, TensorBuffer3D, Vector2D} from './types';\nimport {clamp, getOffsetPoint} from './util';\nimport {addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] = POSE_CHAIN.map(\n ([parentJoinName, childJoinName]): NumberTuple =>\n ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);\n)\n\nconst parentToChildEdges: number[] = parentChildrenTuples.map(\n ([, childJointId]) => childJointId;\n)\n\nconst childToParentEdges: number[] = parentChildrenTuples.map(\n ([parentJointId, parentJointId]) => parentJointId;\n)\n\nfunction getDisplacement(\n edgeId: number, point: Vector2D, displacements: TensorBuffer3D): Vector2D {\n const numEdges = displacements.shape[2] / 2;\n return {\n y: displacements.get(point.y, point.x, edgeId),\n x: displacements.get(point.y, point.x, numEdges + edgeId)\n };\n}\n\nfunction getStridedIndexNearPoint(\n point: Vector2D, outputStride: number, height: number, width:
```

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number): Vector2D {
 return {
 y: clamp(Math.round(point.y / outputStride), 0, height - 1),
 x: clamp(Math.round(point.x / outputStride), 0, width - 1)
 };
}

// We get a new keypoint along the `edgeId` for the pose instance, assuming that the position of the `idSource` part is already known. For this, we follow the displacement vector from the source to target part (stored in the `i`-t channel of the displacement tensor). The displaced keypoint vector is refined using the offset vector by `offsetRefineStep` times.
function traverseToTargetKeypoint(
 edgeId: number, sourceKeypoint: Keypoint, targetKeypointId: number,
 scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride: number,
 displacements: TensorBuffer3D, offsetRefineStep = 2): Keypoint {
 const [height, width] = scoresBuffer.shape;
 // Nearest neighbor interpolation for the source->target displacements.
 const sourceKeypointIndices = getStridedIndexNearPoint(
 sourceKeypoint.position, outputStride, height, width);
 const displacement = getDisplacement(edgeId, sourceKeypointIndices, displacements);
 const displacedPoint = addVectors(sourceKeypoint.position, displacement);
 let targetKeypoint = displacedPoint;
 for (let i = 0; i < offsetRefineStep; i++) {
 const targetKeypointIndices = getStridedIndexNearPoint(targetKeypoint,
 outputStride, height, width);
 const offsetPoint = getOffsetPoint(targetKeypointIndices.y,
 targetKeypointIndices.x, targetKeypointId, offsets);
 targetKeypoint = addVectors(
 {
 x: targetKeypointIndices.x * outputStride,
 y: targetKeypointIndices.y * outputStride
 },
 {
 x: offsetPoint.x, y: offsetPoint.y
 });
 const targetKeypointIndices = getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);
 const score = scoresBuffer.get(targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);
 }
 return { position: targetKeypoint, part: PART_NAMES[targetKeypointId], score };
}

// Follows the displacement fields to decode the full pose of the object instance given the position of a part that acts as root.
@return An array of decoded keypoints and their scores for a single pose
function decodePose(
 root: PartWithScore, scores: TensorBuffer3D, offsets: TensorBuffer3D,
 outputStride: number, displacementsFwd: TensorBuffer3D,
 displacementsBwd: TensorBuffer3D): Keypoint[] {
 const numParts = scores.shape[2];
 const numEdges = parentToChildEdges.length;
 const instanceKeypoints: Keypoint[] = new Array(numParts);
 // Start a new detection instance at the position of the root.
 const { part: rootPart, score: rootScore } = root;
 const rootPoint = getImageCoords(rootPart, outputStride, offsets);
 instanceKeypoints[rootPart.id] = {
 score: rootScore,
 part: PART_NAMES[rootPart.id],
 position: rootPoint
 };
 // Decode the part positions upwards in the tree, following the backward // displacements.
 for (let edge = numEdges - 1; edge >= 0; --edge) {
 const sourceKeypointId = parentToChildEdges[edge];
 const targetKeypointId = childToParentEdges[edge];
 if (instanceKeypoints[sourceKeypointId] && !instanceKeypoints[targetKeypointId]) {
 instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(
 edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,
 offsets, outputStride, displacementsBwd);
 }
 }
 // Decode the part positions downwards in the tree, following the forward // displacements.
 for (let edge = 0; edge < numEdges; ++edge) {
 const sourceKeypointId = childToParentEdges[edge];
 const targetKeypointId = parentToChildEdges[edge];
 if (instanceKeypoints[sourceKeypointId] && !instanceKeypoints[targetKeypointId]) {
 instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(
 edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,
 offsets, outputStride, displacementsFwd);
 }
 }
 return instanceKeypoints;
}

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=====
import { Keypoint, Pose, TensorBuffer3D } from './types';
import { buildPartWithScoreQueue } from './build_part_with_score_queue';
import { decodePose } from './decode_pose';
import { getImageCoords,

```

```

squaredDistance} from './util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],
squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return
poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return
squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <= \n
squaredNmsRadius;\n });\n}\n\n/* Score the newly proposed object instance without taking into account\n * the
scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n
existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let
notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number =>
{\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position,
keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n\n return
notOverlappedKeypointScores /= instanceKeypoints.length;\n}\n\n// A point (y, x) is considered as root part
candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n//
kLocalMaximumRadius.\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts
from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in
decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima
above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of
the queue (in decreasing score order)\n * and treat it as a root candidate for a new object instance. To avoid\n *
duplicate detections, we reject the root candidate if it is within a disk\n * of `nmsRadius` pixels from the
corresponding part of a previously detected\n * instance, which is a form of part-based non-maximum suppression
(NMS). If\n * the root candidate passes the NMS check, we start a new object instance\n * detection, treating the
corresponding part as root and finding the\n * positions of the remaining parts by following the displacement
vectors\n * along the tree-structured part graph. We assign to the newly detected\n * instance a score equal to the
sum of scores of its parts which have not\n * been claimed by a previous instance (i.e., those at least `nmsRadius`\n
* pixels away from the corresponding part of all previously detected\n * instances), divided by the total number of
parts `numParts`.\n *\n * @param heatmapScores 3-D tensor with shape `[height, width, numParts]`.\n *\n * The value
of heatmapScores[y, x, k] is the score of placing the `k`-th\n * object part at position `(y, x)`.\n *\n * @param
offsets 3-D tensor with shape `[height, width, numParts * 2]`.\n *\n * The value of [offsets[y, x, k], offsets[y, x, k +
numParts]] is the\n * short range offset vector of the `k`-th object part at heatmap\n * position `(y, x)`.\n *\n *
@param displacementsFwd 3-D tensor of shape\n * `[height, width, 2 * num_edges]`, where `num_edges =
num_parts - 1` is the\n * number of edges (parent-child pairs) in the tree. It contains the forward\n * displacements
between consecutive part from the root towards the leaves.\n *\n * @param displacementsBwd 3-D tensor of
shape\n * `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the\n * number of edges (parent-
child pairs) in the tree. It contains the backward\n * displacements between consecutive part from the root towards
the leaves.\n *\n * @param outputStride The output stride that was used when feed-forwarding\n * through the
PoseNet model. Must be 32, 16, or 8.\n *\n * @param maxPoseDetections Maximum number of returned instance
detections per\n * image.\n *\n * @param scoreThreshold Only return instance detections that have root part\n *
score greater or equal to this value. Defaults to 0.5.\n *\n * @param nmsRadius Non-maximum suppression part
distance. It needs to be\n * strictly positive. Two parts suppress each other if they are less than\n * `nmsRadius`\n
pixels away. Defaults to 20.\n *\n * @return An array of poses and their scores, each containing keypoints and\n *
the corresponding keypoint scores.\n */\nexport function decodeMultiplePoses(\n scoresBuffer: TensorBuffer3D,
offsetsBuffer: TensorBuffer3D,\n displacementsFwdBuffer: TensorBuffer3D,\n displacementsBwdBuffer:
TensorBuffer3D, outputStride: number,\n maxPoseDetections: number, scoreThreshold = 0.5, nmsRadius = 20):
Pose[] {\n const poses: Pose[] = [];\n\n const queue = buildPartWithScoreQueue(\n scoreThreshold,
kLocalMaximumRadius, scoresBuffer);\n\n const squaredNmsRadius = nmsRadius * nmsRadius;\n\n // Generate
at most maxDetections object instances per image in\n // decreasing root part score order.\n while (poses.length <
maxPoseDetections && !queue.empty()) {\n // The top element in the queue is the next root candidate.\n const
root = queue.dequeue();\n\n // Part-based non-maximum suppression: We reject a root candidate if it\n // is
within a disk of `nmsRadius` pixels from the corresponding part of\n // a previously detected instance.\n const

```



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rootImageCoords =\n getImageCoords(root.part, outputStride, offsetsBuffer);\n if
(withinNmsRadiusOfCorrespondingPoint(\n poses, squaredNmsRadius, rootImageCoords, root.part.id)) {\n
 continue;\n }\n // Start a new detection instance at the position of the root.\n const keypoints =
decodePose(\n root, scoresBuffer, offsetsBuffer, outputStride, displacementsFwdBuffer,\n displacementsBwdBuffer);\n const score = getInstanceScore(poses, squaredNmsRadius, keypoints);\n \n
poses.push({keypoints, score});\n }\n return poses;\n }\n \"/**\n * @license\n * Copyright 2019 Google Inc. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
https://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BaseModel } from './base_model';\n\nconst
imageNetMean = [-123.15, -115.90, -103.06];\n\nexport class ResNet extends BaseModel {\n
preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n return tf.add(input, imageNetMean);\n }\n \n
nameOutputResults(results: tf.Tensor3D[]) {\n const [\n displacementBwd,\n displacementFwd,\n heatmap,\n longOffsets,\n offsets,\n partHeatmaps,\n segmentation,\n partOffsets,\n] = results;\n
return {\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets\n };\n }\n \"/**\n * @license\n * Copyright 2019
Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
https://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nconst RESNET50_BASE_URL =\n 'https://storage.googleapis.com/tfjs-
models/savedmodel/bodypix/resnet50/';\nconst MOBILENET_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet/';\n\n// The BodyPix 2.0 ResNet50
models use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number,
quantBytes: number): string {\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding
to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return RESNET50_BASE_URL +
`float` + graphJson;\n } else {\n return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n }
}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport
function mobileNetSavedModel(\n stride: number, multiplier: number, quantBytes: number): string {\n const
toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n const graphJson = `model-
stride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if
(quantBytes === 4) {\n return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n } else
{\n return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n graphJson;\n }
}\n \"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n * \n *

```

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=====
*\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BodyPixInput, BodyPixOutputStride, Padding } from

```

```

./types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from
./types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\nHTMLCanvasElement|\n OffscreenCanvas): [number, number] {\n if ('offsetHeight' in input
&& input.offsetHeight !== 0\n && 'offsetWidth' in input && input.offsetWidth !== 0) {\n return
[input.offsetHeight, input.offsetWidth];\n } else if (input.height != null && input.width != null) {\n return
[input.height, input.width];\n } else {\n throw new Error(\n `HTMLImageElement must have height and
width attributes set.`);\n }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number,
number] {\n if (input.hasAttribute('height') && input.hasAttribute('width')) {\n // Prioritizes user specified height
and width.\n // We can't test the .height and .width properties directly,\n // because they evaluate to 0 if unset.\n return [input.height, input.width];\n } else {\n return [input.videoHeight, input.videoWidth];\n }\n}\n\n\nexport
function getInputSize(input: BodyPixInput): [number, number] {\n if ((typeof (HTMLCanvasElement) !==
'undefined' &&\n input instanceof HTMLCanvasElement) ||\n (typeof (OffscreenCanvas) !== 'undefined'
&&\n input instanceof OffscreenCanvas) ||\n (typeof (HTMLImageElement) !== 'undefined' &&\n input instanceof HTMLImageElement)) {\n return getSizeFromImageLikeElement(input);\n } else if (typeof
(ImageData) !== 'undefined' && input instanceof ImageData) {\n return [input.height, input.width];\n } else if (\n typeof (HTMLVideoElement) !== 'undefined' &&\n input instanceof HTMLVideoElement) {\n return
getSizeFromVideoElement(input);\n } else if (input instanceof tf.Tensor) {\n return [input.shape[0],
input.shape[1]];\n } else {\n throw new Error(`error: Unknown input type: ${input}.`);\n }\n}\n\n\nfunction
isValidInputResolution(\n resolution: number, outputStride: number): boolean {\n return (resolution - 1) %
outputStride === 0;\n}\n\n\nexport function toValidInputResolution(\n inputResolution: number, outputStride:
BodyPixOutputStride): number {\n if (isValidInputResolution(inputResolution, outputStride)) {\n return
inputResolution;\n }\n return Math.floor(inputResolution / outputStride) * outputStride + 1;\n}\n\n\nconst
INTERNAL_RESOLUTION_STRING_OPTIONS = {\n low: 'low',\n medium: 'medium',\n high: 'high',\n full:
'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION =
0.1;\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n internalResolution:
BodyPixInternalResolution): number {\n if (typeof internalResolution === 'string') {\n const
result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n tf.util.assert(\n typeof result
=== 'number',\n () => `string value of inputResolution must be one of ${\n
Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n .join(',')\n } but was
${internalResolution}.`);\n return result;\n } else {\n tf.util.assert(\n typeof internalResolution
=== 'number'
&&\n internalResolution <= MAX_INTERNAL_RESOLUTION &&\n internalResolution >=
MIN_INTERNAL_RESOLUTION,\n () =>`\n `inputResolution must be a string or number between ${\n
 MIN_INTERNAL_RESOLUTION\n } and ${MAX_INTERNAL_RESOLUTION}, but ` +\n `was
${internalResolution}`);\n return internalResolution;\n }\n}\n\n\nexport function
toInputResolutionHeightAndWidth(\n internalResolution: BodyPixInternalResolution,\n outputStride:
BodyPixOutputStride,\n [inputHeight, inputWidth]: [number, number]): [number, number] {\n const
internalResolutionPercentage =\n toInternalResolutionPercentage(internalResolution);\n return [\n toValidInputResolution(\n inputHeight * internalResolutionPercentage, outputStride),\n toValidInputResolution(\n inputWidth * internalResolutionPercentage, outputStride)\n];\n}\n\n\nexport function
toInputTensor(input: BodyPixInput) {\n // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n //
@ts-ignore\n return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\n\nexport function
resizeAndPadTo(\n imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n flipHorizontal = false):
{\n resizedAndPadded: tf.Tensor3D,\n paddedBy: [[number, number], [number, number]]\n} {\n const [height,
width] = imageTensor.shape;\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n let

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resizeW: number;\n let resizeH: number;\n let padL: number;\n let padR: number;\n let padT: number;\n let
padB: number;\n\n if (aspect > targetAspect) {\n // resize to have the larger dimension match the shape.\n
resizeW = targetW;\n resizeH = Math.ceil(resizeW / aspect);\n\n const padHeight = targetH - resizeH;\n padL
= 0;\n padR = 0;\n padT = Math.floor(padHeight / 2);\n padB = targetH - (resizeH + padT);\n } else {\n
resizeH = targetH;\n resizeW = Math.ceil(targetH * aspect);\n\n const padWidth = targetW - resizeW;\n padL
= Math.floor(padWidth / 2);\n padR = targetW - (resizeW + padL);\n padT = 0;\n padB = 0;\n }\n\n const
resizedAndPadded = tf.tidy(() => {\n // resize to have largest dimension match image\n let resized:
tf.Tensor3D;\n if (flipHorizontal) {\n resized = tf.image.resizeBilinear(\n tf.reverse(imageTensor, 1),
[resizeH, resizeW]);\n } else {\n resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n
}\n\n const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n\n return padded;\n });\n\n return
{resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n}\n\n\nexport function
scaleAndCropToInputTensorShape(\n tensor: tf.Tensor3D,\n [inputTensorHeight, inputTensorWidth]: [number,
number],\n [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n [[padT, padB], [padL,
padR]]: [[number, number], [number, number]],\n applySigmoidActivation = false): tf.Tensor3D {\n return
tf.tidy(() => {\n let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n
[resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n\n if (applySigmoidActivation) {\n
inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n }\n\n return removePaddingAndResizeBack(\n
inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n [[padT, padB], [padL, padR]]);\n
});\n}\n\n\nexport function removePaddingAndResizeBack(\n resizedAndPadded: tf.Tensor3D,\n [originalHeight,
originalWidth]: [number, number],\n [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n
tf.Tensor3D {\n return tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n
return tf.squeeze(tf.image\n .cropAndResize(\n batchedImage, [[\n padT / (originalHeight +
padT + padB - 1.0),\n padL / (originalWidth + padL + padR - 1.0),\n (padT + originalHeight - 1.0)
/\n (originalHeight + padT + padB - 1.0),\n (padL + originalWidth - 1.0) / (originalWidth + padL
+ padR - 1.0)\n]],\n [0], [originalHeight, originalWidth], [0]);\n });\n}\n\n\nexport function resize2d(\n
tensor: tf.Tensor2D, resolution: [number, number],\n nearestNeighbor?: boolean): tf.Tensor2D {\n return
tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(tensor, 2);\n return tf.squeeze(\n
tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n });\n}\n\n\nexport function
padAndResizeTo(\n input: BodyPixInput, [targetH, targetW]: [number, number]):\n {resized: tf.Tensor3D,
padding: Padding} {\n const [height, width] = getInputSize(input);\n const targetAspect = targetW / targetH;\n
const aspect = width / height;\n let [padT, padB, padL, padR] = [0, 0, 0, 0];\n if (aspect < targetAspect) {\n //
pads the width\n padT = 0;\n padB = 0;\n padL = Math.round(0.5 * (targetAspect * height - width));\n padR
= Math.round(0.5 * (targetAspect * height - width));\n } else {\n // pads the height\n padT = Math.round(0.5 *
((1.0 / targetAspect) * width - height));\n padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n
padL = 0;\n padR = 0;\n }\n\n const resized: tf.Tensor3D = tf.tidy(() => {\n let imageTensor =
toInputTensor(input);\n imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n return
tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n });\n\n return {resized, padding: {top: padT, left: padL,
right: padR, bottom: padB}};\n}\n\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\n
Promise<TensorBuffer3D[]> {\n return Promise.all(tensors.map(tensor => tensor.buffer()));\n}\n\n\nexport function
scalePose(\n pose: Pose, scaleY: number, scaleX: number, offsetY = 0,\n offsetX = 0): Pose {\n return {\n
score: pose.score,\n keypoints: pose.keypoints.map(({score, part, position}) => ({\n
score,\n
part,\n
position: {\n
x: position.x * scaleX +
offsetX,\n
y: position.y * scaleY + offsetY\n
}})\n
});\n}\n\n\nexport function scalePoses(\n poses: Pose[], scaleY: number, scaleX: number, offsetY = 0, offsetX
= 0) {\n if (scaleX === 1 && scaleY === 1 && offsetY === 0 && offsetX === 0) {\n return poses;\n }\n return
poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n}\n\n\nexport function
flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n return {\n score: pose.score,\n keypoints:
pose.keypoints.map(\n ({score, part, position}) => ({\n score,\n part,\n position: {x:

```

```

imageWidth - 1 - position.x, y: position.y)\n))\n };\n\nexport function flipPosesHorizontal(poses: Pose[],
imageWidth: number) {\n if (imageWidth <= 0) {\n return poses;\n }\n return poses.map(pose =>
flipPoseHorizontal(pose, imageWidth));\n}\n\nexport function scaleAndFlipPoses(\n poses: Pose[], [height,
width]: [number, number],\n [inputResolutionHeight, inputResolutionWidth]: [number, number],\n padding:
Padding, flipHorizontal: boolean): Pose[] {\n const scaleY =\n (height + padding.top + padding.bottom) /
(inputResolutionHeight);\n const scaleX =\n (width + padding.left + padding.right) /
(inputResolutionWidth);\n\n const scaledPoses =\n scalePoses(poses, scaleY, scaleX, -padding.top, -
padding.left);\n\n if (flipHorizontal) {\n return flipPosesHorizontal(scaledPoses, width);\n } else {\n return
scaledPoses;\n }\n}\n", "\n**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport
{BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation,
toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport
{decodePersonInstanceMasks, decodePersonInstancePartMasks} from
'./multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from
'./multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel,
resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput,
BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from
'./types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,
SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo,
scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D}
from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING =
false;\n\n**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n * `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported
architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix
model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of
speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n
* stride 8,16,32 are supported for various MobileNetV1 models.\n *\n * `multiplier`: An optional number with
values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier
for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and
more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of
accuracy.\n *\n * `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for
area/countries that don't have access to the model hosted on\n * GCP.\n *\n * `quantBytes`: An optional number
with values: 1, 2, or 4. This parameter\n * affects weight quantization in the models. The available options are\n * 1
byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time,
the lower the value, the shorter the\n * loading time but lower the accuracy.\n *\n\nexport interface ModelConfig {\n
architecture: BodyPixArchitecture;\n outputStride: BodyPixOutputStride;\n multiplier?: BodyPixMultiplier;\n
modelUrl?: string;\n quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading
MobileNetV1 based BodyPix.\n// (And for references, the default configuration for loading ResNet\n// based
PoseNet is also included).\n//\n// ``\n// const RESNET_CONFIG = {\n// architecture: 'ResNet50',\n//
outputStride: 32,\n// quantBytes: 4,\n// } as ModelConfig;\n//\n// ``\n\nconst MOBILENET_V1_CONFIG = {\n
architecture: 'MobileNetV1',\n outputStride: 16,\n quantBytes: 4,\n multiplier: 0.75,\n} as ModelConfig;\n\nconst

```

```

VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];
const VALID_STRIDE: {[id: string]: BodyPixOutputStride[]} = {
 'MobileNetV1': [8, 16, 32],
 'ResNet50': [32, 16]
};
const VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {
 'MobileNetV1': [0.50, 0.75, 1.0],
 'ResNet50': [1.0]
};
const VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];
function validateModelConfig(config: ModelConfig): ModelConfig {
 config = config || MOBILENET_V1_CONFIG;
 if (config.architecture == null) {
 config.architecture = 'MobileNetV1';
 }
 if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {
 throw new Error(`Invalid architecture ${config.architecture}. Should be one of ${VALID_ARCHITECTURE}`);
 }
 if (config.outputStride == null) {
 config.outputStride = 16;
 }
 if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {
 throw new Error(`Invalid outputStride ${config.outputStride}. Should be one of ${VALID_STRIDE[config.architecture]} for architecture ${config.architecture}`);
 }
 if (config.multiplier == null) {
 config.multiplier = 1.0;
 }
 if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {
 throw new Error(`Invalid multiplier ${config.multiplier}. Should be one of ${VALID_MULTIPLIER[config.architecture]} for architecture ${config.architecture}`);
 }
 if (config.quantBytes == null) {
 config.quantBytes = 4;
 }
 if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {
 throw new Error(`Invalid quantBytes ${config.quantBytes}. Should be one of ${VALID_QUANT_BYTES} for architecture ${config.architecture}`);
 }
 return config;
}

/**
 * BodyPix inference is configurable using the following config dictionary.
 * `flipHorizontal`: If the left-right keypoint of poses/part segmentation should be flipped/mirrored horizontally. This should be set to true for videos where the video is by default flipped horizontally (i.e. a webcam), and you want the person & body part segmentation to be returned in the proper orientation.
 * `internalResolution`: Defaults to 'medium'. The internal resolution percentage that the input is resized to before inference. The larger the internalResolution the more accurate the model at the cost of slower prediction times. Available values are 'low', 'medium', 'high', 'full', or a percentage value between 0 and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.
 * `segmentationThreshold`: The minimum that segmentation values must have to be considered part of the person. Affects the generation of the segmentation mask. More specifically, it is the threshold used to binarize the intermediate person segmentation probability. The probability of each pixel belongs to a person is in range [0, 1]. If the probability is greater than the `segmentationThreshold`, it will be set to 1 otherwise 0.
 */
export interface InferenceConfig {
 flipHorizontal?: boolean;
 internalResolution?: BodyPixInternalResolution;
 segmentationThreshold?: number;
}

/**
 * Person Inference Config
 */
export interface PersonInferenceConfig extends InferenceConfig {
 maxDetections?: number;
 scoreThreshold?: number;
 nmsRadius?: number;
}

/**
 * Multiple Person Instance Inference Config
 */
export interface MultiPersonInstanceInferenceConfig extends InferenceConfig {
 maxDetections?: number;
 scoreThreshold?: number;
 nmsRadius?: number;
 minKeypointScore?: number;
 refineSteps?: number;
}

export const PERSON_INFERENCE_CONFIG: PersonInferenceConfig = {

```

```

flipHorizontal: false,\n internalResolution: 'medium',\n segmentationThreshold: 0.7,\n maxDetections: 10,\n scoreThreshold: 0.4,\n nmsRadius: 20,\n};\n\nexport const
MULTI_PERSON_INSTANCE_INFERENCE_CONFIG:\n MultiPersonInstanceInferenceConfig = {\n
flipHorizontal: false,\n internalResolution: 'medium',\n segmentationThreshold: 0.7,\n maxDetections:
10,\n scoreThreshold: 0.4,\n nmsRadius: 20,\n minKeypointScore: 0.3,\n refineSteps: 10\n
};\n\nfunction validatePersonInferenceConfig(config: PersonInferenceConfig) {\n const {segmentationThreshold,
maxDetections, scoreThreshold, nmsRadius} =\n config;\n\n if (segmentationThreshold < 0.0 ||
segmentationThreshold > 1.0) {\n throw new Error(\n `segmentationThreshold ${segmentationThreshold}. `
+\n `Should be in range [0.0, 1.0]`);\n }\n\n if (maxDetections <= 0) {\n throw new Error(\n `Invalid
maxDetections ${maxDetections}. ` +\n `Should be > 0`);\n }\n\n if (scoreThreshold < 0.0 || scoreThreshold >
1.0) {\n throw new Error(\n `Invalid scoreThreshold ${scoreThreshold}. ` +\n `Should be in range [0.0,
1.0]`);\n }\n\n if (nmsRadius <= 0) {\n throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n
}\n\n}\n\nfunction validateMultiPersonInstanceInferenceConfig(\n config: MultiPersonInstanceInferenceConfig) {\n
const {\n segmentationThreshold,\n maxDetections,\n scoreThreshold,\n nmsRadius,\n
minKeypointScore,\n refineSteps\n } = config;\n\n if (segmentationThreshold < 0.0 || segmentationThreshold >
1.0) {\n throw new Error(\n `segmentationThreshold ${segmentationThreshold}. ` +\n `Should be in
range [0.0, 1.0]`);\n }\n\n if (maxDetections <= 0) {\n throw new Error(\n `Invalid maxDetections
${maxDetections}. ` +\n `Should be > 0`);\n }\n\n if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n throw
new Error(\n `Invalid scoreThreshold ${scoreThreshold}. ` +\n `Should be in range [0.0, 1.0]`);\n }\n\n if
(nmsRadius <= 0) {\n throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n }\n\n if (minKeypointScore < 0 ||
minKeypointScore > 1) {\n throw new Error(\n `Invalid minKeypointScore ${minKeypointScore}. ` +\n
`Should be in range [0.0, 1.0]`);\n }\n\n if (refineSteps <= 0 || refineSteps > 20) {\n throw new Error(\n
`Invalid refineSteps ${refineSteps}. ` +\n `Should be in range [1, 20]`);\n }\n\n}\n\n\nexport class BodyPix {\n
baseModel: BaseModel;\n\n constructor(net: BaseModel) {\n this.baseModel = net;\n }\n\n private
predictForPersonSegmentation(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n heatmapScores:
tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n
}\n\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
} = this.baseModel.predict(input);\n return {\n segmentLogits: segmentation,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n
partHeatmapLogits: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd:
tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n }\n\n const {\n segmentation,\n partHeatmaps,\n
heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.baseModel.predict(input);\n
return {\n segmentLogits: segmentation,\n partHeatmapLogits: partHeatmaps,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n {\n segmentLogits:
tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n
displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D\n } {\n
const {\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd,\n partHeatmaps,\n } = this.baseModel.predict(input);\n return {\n segmentLogits:
segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
partHeatmaps\n };\n }\n\n /**\n * Given an image with people, returns a dictionary of all intermediate\n *
tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)
heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that
the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the
cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value

```

between 0 and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.

**@param segmentationThreshold** The minimum that segmentation values must have to be considered part of the person. Affects the generation of the segmentation mask.

**@return** A dictionary containing 'segmentation', 'heatmapScores', 'offsets', and 'padding':

- segmentation**: A 2d Tensor with 1 for the pixels that are part of the person, and 0 otherwise. The width and height correspond to the same dimensions of the input image.
- heatmapScores**: A 3d Tensor of the keypoint heatmaps used by pose estimation decoding.
- offsets**: A 3d Tensor of the keypoint offsets used by pose estimation decoding.
- displacementFwd**: A 3d Tensor of the keypoint forward displacement used by pose estimation decoding.
- displacementBwd**: A 3d Tensor of the keypoint backward displacement used by pose estimation decoding.
- padding**: The padding (unit pixels) being applied to the input image before it is fed into the model.

```

\n segmentPersonActivation(\n input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n segmentation: tf.Tensor2D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd:
tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n } {\n const
[height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.predictForPersonSegmentation(resized);\n const [resizedHeight, resizedWidth]
= resized.shape;\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits,
[height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left,
padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n return {\n segmentation: toMaskTensor(\n tf.squeeze(scaledSegmentScores), segmentationThreshold),\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n });\n resized.dispose();\n return {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n };\n });\n }

```

**\* Given an image with many people, returns a PersonSegmentation dictionary that contains the segmentation mask for all people and a single pose.**

**Note:** The segmentation mask returned by this method covers all people but the pose works well for one person. If you want to estimate instance-level multiple person segmentation & pose for each person, use `segmentMultiPerson` instead.

**@param input** ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)

**@param config** PersonInferenceConfig object that contains parameters for the BodyPix inference using person decoding.

**@return** A SemanticPersonSegmentation dictionary that contains height, width, the flattened binary segmentation mask and the poses for all people.

The width and height correspond to the same dimensions of the input image.

- height**: The height of the segmentation data in pixel unit.
- width**: The width of the segmentation data in pixel unit.
- data**: The flattened Uint8Array of segmentation data. 1 means the pixel belongs to a person and 0 means the pixel doesn't belong to a person. The size of the array is equal to `height` x `width` in row-major order.
- allPoses**: The 2d poses of all people.

```

\n async segmentPerson(\n input: BodyPixInput,\n config: PersonInferenceConfig =
PERSON_INFERENCE_CONFIG):\n Promise<SemanticPersonSegmentation> {\n config =
{...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonActivation(\n input,\n config.internalResolution, config.segmentationThreshold);\n const [height, width] = segmentation.shape;\n const result = await segmentation.data() as Uint8Array;\n segmentation.dispose();\n const tensorBuffers =
await toTensorBuffers3D(\n [heatmapScores, offsets, displacementFwd, displacementBwd]);\n const
[scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n let poses =

```

```

decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n poses =
scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n
FLIP_POSES_AFTER_SCALING);\n\n heatmapScores.dispose();\n offsets.dispose();\n
displacementFwd.dispose();\n displacementBwd.dispose();\n\n return {height, width, data: result, allPoses:
poses};\n }\n\n /**\n * Given an image with multiple people, returns an *array* of\n * PersonSegmentation
object. Each element in the array corresponding to one\n * of the people in the input image. In other words, it
predicts\n * instance-level multiple person segmentation & pose for each person.\n *\n * The model does
standard ImageNet pre-processing before inferring through\n * the model. The image pixels should have values [0-
255].\n *\n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)
The input\n * image to feed through the network.\n *\n * @param config MultiPersonInferenceConfig object
that contains\n * parameters for the BodyPix inference using multi-person decoding.\n *\n * @return An array of
PersonSegmentation object, each containing a width,\n * height, a binary array (1 for the pixels that are part of
the\n * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n * number of pixels in the
image. The width and height correspond to the\n * dimensions of the image the binary array is shaped to, which are
the same\n * dimensions of the input image.\n */\n async segmentMultiPerson(\n input: BodyPixInput,\n
config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n
Promise<PersonSegmentation[]> {\n config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG,
...config};\n validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] =
getInputSize(input);\n const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n
config.internalResolution, this.baseModel.outputStride,\n [height, width]);\n\n const {resized, padding} =\n
padAndResizeTo(input, internalResolutionHeightAndWidth);\n const {\n segmentation,\n longOffsets,\n
heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], internalResolutionHeightAndWidth,\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n
const longOffsetsResized = false;\n let scaledLongOffsets;\n if (longOffsetsResized) {\n
scaledLongOffsets = scaleAndCropToInputTensorShape(\n longOffsets, [height, width],
internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n } else {\n scaledLongOffsets = longOffsets;\n }\n\n const
segmentation = toMaskTensor(\n tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n\n
return {\n segmentation,\n longOffsets: scaledLongOffsets,\n heatmapScoresRaw: heatmapScores,\n
offsetsRaw: offsets,\n displacementFwdRaw: displacementFwd,\n displacementBwdRaw:
displacementBwd,\n };\n });\n\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n const [scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n\n let poses = decodeMultiplePoses(\n
scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride,
config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n poses = scaleAndFlipPoses(\n
poses, [height, width], internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n\n
const instanceMasks = await decodePersonInstanceMasks(\n segmentation, longOffsets, poses, height, width,\n
this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n config.scoreThreshold,
config.refineSteps, config.minKeypointScore,\n config.maxDetections);\n\n resized.dispose();\n
segmentation.dispose();\n longOffsets.dispose();\n heatmapScoresRaw.dispose();\n
offsetsRaw.dispose();\n displacementFwdRaw.dispose();\n displacementBwdRaw.dispose();\n\n
return instanceMasks;\n }\n\n /**\n * Given an image with many people, returns a dictionary containing: height,\n * width, a tensor with a part id from 0-
24 for the pixels that are\n * part of a corresponding body part, and -1 otherwise. This does standard\n * ImageNet

```



pre-processing before inferring through the model. The image should pixels should have values [0-255].

**@param** input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input image to feed through the network.

**@param** internalResolution Defaults to 'medium'. The internal resolution percentage that the input is resized to before inference. The larger the internalResolution the more accurate the model at the cost of slower prediction times. Available values are 'low', 'medium', 'high', 'full', or a percentage value between 0 and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.

**@param** segmentationThreshold The minimum that segmentation values must have to be considered part of the person. Affects the clipping of the colored part image.

**@return** A dictionary containing `partSegmentation`, `heatmapScores`, `offsets`, and `padding`:

- `partSegmentation`: A 2d Tensor with a part id from 0-24 for the pixels that are part of a corresponding body part, and -1 otherwise.
- `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by single-person pose estimation decoding.
- `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose estimation decoding.
- `displacementFwd`: A 3d Tensor of the keypoint forward displacement used by pose estimation decoding.
- `displacementBwd`: A 3d Tensor of the keypoint backward displacement used by pose estimation decoding.
- `padding`: The padding (unit pixels) being applied to the input image before it is fed into the model.

```

segmentPersonPartsActivation(
 input: BodyPixInput,
 internalResolution: BodyPixInternalResolution,
 segmentationThreshold = 0.5): {
 partSegmentation:
 tf.Tensor2D,
 heatmapScores: tf.Tensor3D,
 offsets: tf.Tensor3D,
 displacementFwd: tf.Tensor3D,
 displacementBwd: tf.Tensor3D,
 padding: Padding,
 internalResolutionHeightAndWidth: [number, number]
}
const [height, width] = getInputSize(input);
const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(
 internalResolution, this.baseModel.outputStride, [height, width]);
const [resized, padding] = padAndResizeTo(input, internalResolutionHeightAndWidth);
const [partSegmentation, heatmapScores, offsets, displacementFwd, displacementBwd] =
tf.tidy(() => {
 const [segmentLogits, partHeatmapLogits, heatmapScores, offsets, displacementFwd, displacementBwd] =
this.predictForPersonSegmentationAndPart(resized);
const [resizedHeight, resizedWidth] = resized.shape;
const scaledSegmentScores =
scaleAndCropToInputTensorShape(
 segmentLogits, [height, width], [resizedHeight, resizedWidth],
[[padding.top, padding.bottom], [padding.left, padding.right]],
APPLY_SIGMOID_ACTIVATION);
const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(
 partHeatmapLogits, [height, width],
[resizedHeight, resizedWidth],
[[padding.top, padding.bottom], [padding.left, padding.right]],
APPLY_SIGMOID_ACTIVATION);
const segmentation =
toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);
return {
 partSegmentation:
 decodePartSegmentation(segmentation, scaledPartHeatmapScore),
 heatmapScores,
 offsets,
 displacementFwd,
 displacementBwd,
};
resized.dispose();
return {
 partSegmentation,
 heatmapScores,
 offsets,
 displacementFwd,
 displacementBwd,
padding,
 internalResolutionHeightAndWidth
};
})

```

**Given an image with many people, returns a PartSegmentation dictionary that contains the body part segmentation mask for all people and a single pose.**

**Note:** The body part segmentation mask returned by this method covers all people but the pose works well when there is one person. If you want to estimate instance-level multiple person body part segmentation & pose for each person, use `segmentMultiPersonParts` instead.

**@param** input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input image to feed through the network.

**@param** config PersonInferenceConfig object that contains parameters for the BodyPix inference using single person decoding.

**@return** A SemanticPartSegmentation dictionary that contains height, width, the flattened binary segmentation mask and the pose for the person. The width and height correspond to the same dimensions of the input image.

- `height`: The height of the person part segmentation data in pixel unit.
- `width`: The width of the person part segmentation data in pixel unit.
- `data`: The flattened Int32Array of person part segmentation data with a part id from 0-24 for the pixels that are part of a corresponding body part, and -1 otherwise. The size of the array is equal to `height` x `width` in

```

row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n async segmentPersonParts(\n input:
BodyPixInput,\n config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n
Promise<SemanticPartSegmentation> {\n config = {...PERSON_INFERENCE_CONFIG, ...config};\n\n
validatePersonInferenceConfig(config);\n const {\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonPartsActivation(\n input, config.internalResolution, config.segmentationThreshold);\n\n
const [height, width] = partSegmentation.shape;\n const data = await partSegmentation.data() as Int32Array;\n
partSegmentation.dispose();\n\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScores, offsets,
displacementFwd, displacementBwd]);\n const [scoresBuf, offsetsBuf, displacementsFwdBuf,
displacementsBwdBuf] =\n tensorBuffers;\n\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n poses = scaleAndFlipPoses(\n poses, [height, width],
internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n\n heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n\n
return {height, width, data, allPoses: poses};\n }\n\n /**\n * Given an image with multiple people, returns an
array of PartSegmentation\n * object. Each element in the array corresponding to one\n * of the people in the
input image. In other words, it predicts\n * instance-level multiple person body part segmentation & pose for
each\n * person.\n *\n * This does standard ImageNet pre-processing before inferring through\n * the model.
The image pixels should have values [0-255].\n *\n * @param input\n *
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n * image to feed
through the network.\n *\n * @param config MultiPersonInferenceConfig object that contains\n * parameters for
the BodyPix inference using multi-person decoding.\n *\n * @return An array of PartSegmentation object, each
containing a width,\n * height, a flattened array (with part id from 0-24 for the pixels that are\n * part of a
corresponding body part, and -1 otherwise) and 2D pose. The width\n * and height correspond to the dimensions of
the image. Each flattened part\n * segmentation array size is equal to `height` x `width`.\n */\n async
segmentMultiPersonParts(\n input: BodyPixInput,\n config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n config =
{...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n\n
validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] = getInputSize(input);\n const
internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n config.internalResolution,
this.baseModel.outputStride,\n [height, width]);\n const {resized, padding} =\n padAndResizeTo(input,
internalResolutionHeightAndWidth);\n const {\n segmentation,\n longOffsets,\n heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n partSegmentation,\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n partHeatmaps\n } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n // decoding with scaling.\n const
scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits, [height, width],
internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n\n // decoding with scaling.\n const scaledPartSegmentationScores =
scaleAndCropToInputTensorShape(\n partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n\n
const scaledLongOffsets = longOffsets;\n const segmentation = toMaskTensor(\n
tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n const partSegmentation =\n
decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n return {\n segmentation,\n longOffsets:
scaledLongOffsets,\n heatmapScoresRaw: heatmapScores,\n offsetsRaw: offsets,\n
displacementFwdRaw: displacementFwd,\n displacementBwdRaw: displacementBwd,\n
partSegmentation\n }; \n });\n\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n const [scoresBuf, offsetsBuf,

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displacementsFwdBuf, displacementsBwdBuf] = \n tensorBuffers;\n\n let poses = decodeMultiplePoses(\n
scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf, \n this.baseModel.outputStride,
config.maxDetections, \n config.scoreThreshold, config.nmsRadius);\n\n poses = scaleAndFlipPoses(\n
poses, [height, width], internalResolutionHeightAndWidth, padding, \n FLIP_POSES_AFTER_SCALING);\n\n const instanceMasks = await decodePersonInstancePartMasks(\n segmentation, longOffsets, partSegmentation,
poses, height, width, \n this.baseModel.outputStride, internalResolutionHeightAndWidth, padding, \n
config.scoreThreshold, config.refineSteps, config.minKeypointScore, \n config.maxDetections);\n\n resized.dispose();\n segmentation.dispose();\n longOffsets.dispose();\n heatmapScoresRaw.dispose();\n
offsetsRaw.dispose();\n displacementFwdRaw.dispose();\n displacementBwdRaw.dispose();\n
partSegmentation.dispose();\n\n return instanceMasks;\n }\n\n public dispose() {\n this.baseModel.dispose();\n
}\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\n\n async function loadMobileNet(config: ModelConfig):
Promise<BodyPix> {\n const outputStride = config.outputStride;\n const quantBytes = config.quantBytes;\n const
multiplier = config.multiplier;\n if (tf == null) {\n throw new Error(\n `Cannot find TensorFlow.js. If you are
using a <script> tag, please ` +\n `also include @tensorflow/tfjs on the page before using this\n model.`);\n
}\n\n const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n const mobilenet = new MobileNet(graphModel, outputStride);\n
return new BodyPix(mobilenet);\n}\n\n/**\n * Loads the ResNet BodyPix model.\n */\n\n async function
loadResNet(config: ModelConfig): Promise<BodyPix> {\n const outputStride = config.outputStride;\n const
quantBytes = config.quantBytes;\n if (tf == null) {\n throw new Error(\n `Cannot find TensorFlow.js. If you
are using a <script> tag, please ` +\n `also include @tensorflow/tfjs on the page before using this\n
model.`);\n }\n\n const url = resNet50SavedModel(outputStride, quantBytes);\n const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n const resnet = new ResNet(graphModel, outputStride);\n return
new BodyPix(resnet);\n}\n\n/**\n * Loads the BodyPix model instance from a checkpoint, with the ResNet\n * or
MobileNet architecture. The model to be loaded is configurable using the\n * config dictionary ModelConfig. Please
find more details in the\n * documentation of the ModelConfig.\n */\n\n @param config ModelConfig dictionary that
contains parameters for\n * the BodyPix loading process. Please find more details of each parameters\n * in the
documentation of the ModelConfig interface. The predefined\n * `MOBILENET_V1_CONFIG` and
`RESNET_CONFIG` can also be used as references\n * for defining your customized config.\n */\n\n export async
function load(config: ModelConfig = MOBILENET_V1_CONFIG): Promise<BodyPix> {\n config =
validateModelConfig(config);\n if (config.architecture === 'ResNet50') {\n return loadResNet(config);\n } else if
(config.architecture === 'MobileNetV1') {\n return loadMobileNet(config);\n } else {\n return null;\n
}\n}\n\n", /**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n */\n\n
===== \n
*\n\nimport {cpuBlur} from './blur';\nimport {Color, PartSegmentation, PersonSegmentation} from
 './types';\nimport {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\nimport {getInputSize}
from './util';\n\nexport type Canvas = HTMLCanvasElement | OffscreenCanvas;\n\nconst offScreenCanvases:
 {[name: string]: Canvas} = {};\n\ntype ImageType = HTMLImageElement|HTMLVideoElement|Canvas;\ntype
HasDimensions = {\n width: number, \n height: number\n};\n\nfunction isSafari() {\n return
(/^(?!chrome|android).*safari/i.test(navigator.userAgent));\n}\n\nfunction assertSameDimensions(\n {width:
widthA, height: heightA}: HasDimensions, \n {width: widthB, height: heightB}: HasDimensions, nameA: string, \n
 nameB: string) {\n if (widthA !== widthB || heightA !== heightB) {\n throw new Error(`error: dimensions must
match. ${nameA} has dimensions ${\n widthA}x${heightA}, ${nameB} has dimensions
${\n widthB}x${heightB}`);\n }\n}\n\nfunction flipCanvasHorizontal(canvas: Canvas) {\n const ctx =

```

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canvas.getContext('2d');
ctx.scale(-1, 1);
ctx.translate(-canvas.width, 0);
function
drawWithCompositing(
 ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D,
 image:
 Canvas|ImageType,
 compositeOperation: string) {
 ctx.globalCompositeOperation = compositeOperation;
 ctx.drawImage(image, 0, 0);
}
function createOffScreenCanvas(): Canvas {
 if (typeof document !==
 'undefined') {
 return document.createElement('canvas');
 } else if (typeof OffscreenCanvas !== 'undefined')
 {
 return new OffscreenCanvas(0, 0);
 } else {
 throw new Error('Cannot create a canvas in this context');
 }
}
function ensureOffscreenCanvasCreated(id: string): Canvas {
 if (!offScreenCanvases[id]) {
 offScreenCanvases[id] = createOffScreenCanvas();
 }
 return offScreenCanvases[id];
}
function
drawAndBlurImageOnCanvas(
 image: ImageType, blurAmount: number, canvas: Canvas) {
 const {height,
 width} = image;
 const ctx = canvas.getContext('2d');
 canvas.width = width;
 canvas.height = height;
 ctx.clearRect(0, 0, width, height);
 ctx.save();
 if (isSafari()) {
 cpuBlur(canvas, image, blurAmount);
 } else
 {
 // tslint:disable:no-any
 (ctx as any).filter = `blur(${blurAmount}px)`;
 ctx.drawImage(image, 0, 0,
 width, height);
 }
 ctx.restore();
}
function drawAndBlurImageOnOffScreenCanvas(
 image: ImageType,
 blurAmount: number,
 offscreenCanvasName: string): Canvas {
 const canvas =
 ensureOffscreenCanvasCreated(offscreenCanvasName);
 if (blurAmount === 0) {
 renderImageToCanvas(image, canvas);
 } else {
 drawAndBlurImageOnCanvas(image, blurAmount, canvas);
 }
 return canvas;
}
function renderImageToCanvas(image: ImageType, canvas: Canvas) {
 const {width,
 height} = image;
 canvas.width = width;
 canvas.height = height;
 const ctx = canvas.getContext('2d');
 ctx.drawImage(image, 0, 0, width, height);
}
function
renderImageDataToCanvas(image: ImageData, canvas: Canvas) {
 canvas.width = image.width;
 canvas.height
 = image.height;
 const ctx = canvas.getContext('2d');
 ctx.putImageData(image, 0, 0);
}
function
renderImageDataToOffScreenCanvas(
 image: ImageData, canvasName: string): Canvas {
 const canvas =
 ensureOffscreenCanvasCreated(canvasName);
 renderImageDataToCanvas(image, canvas);
 return
 canvas;
}
function * Given the output from estimating multi-person segmentation, generates an
image with
foreground and background color at each pixel determined by the
corresponding binary segmentation value at
the pixel from the output. In
other words, pixels where there is a person will be colored with foreground
color and where there is not a person will be colored with background color.
@param
personOrPartSegmentation The output from `segmentPerson`, `segmentMultiPerson`,
`segmentPersonParts`
or `segmentMultiPersonParts`. They can
be SemanticPersonSegmentation object, an array of
PersonSegmentation object,
SemanticPartSegmentation object, or an array of PartSegmentation object.
@param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color
(r,g,b,a) for visualizing pixels that
belong to people.
@param background Default to {r:0, g:0, b:0, a: 255}. The background color
(r,g,b,a)
for visualizing pixels that don't belong to people.
@param drawContour Default to false. Whether to draw
the contour around each
person's segmentation mask or body part mask.
@param foregroundIds Default
to [1]. The integer values that represent
foreground. For person segmentation, 1 is the foreground. For body
part
segmentation, it can be a subset of all body parts ids.
@returns An ImageData with the same width
and height of
all the PersonSegmentation in multiPersonSegmentation, with opacity and
transparency at each
pixel determined by the corresponding binary
segmentation value at the pixel from the output.
export
function toMask(
 personOrPartSegmentation: SemanticPersonSegmentation|
 SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],
 foreground: Color = {
 r: 0,
 g:
 0,
 b: 0,
 a: 0
 },
 background: Color = {
 r: 0,
 g: 0,
 b: 0,
 a: 255
 },
 drawContour = false, foregroundIds: number[] = [1]): ImageData {
 if (Array.isArray(personOrPartSegmentation)
 &&
 personOrPartSegmentation.length === 0) {
 return null;
 }
 let multiPersonOrPartSegmentation:
 Array<SemanticPersonSegmentation|SemanticPartSegmentation|
 PersonSegmentation|PartSegmentation>;
 if (!Array.isArray(personOrPartSegmentation)) {
 multiPersonOrPartSegmentation = [personOrPartSegmentation];
 } else {
 multiPersonOrPartSegmentation =
 personOrPartSegmentation;
 }
 const {width, height} = multiPersonOrPartSegmentation[0];
 const bytes =
 new Uint8ClampedArray(width * height * 4);
 function drawStroke(
 bytes: Uint8ClampedArray, row:

```

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number, column: number, width: number,\n radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n
for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++) {\n if (i !== 0 && j !== 0) {\n
 const n = (row + i) * width + (column + j);\n bytes[4 * n + 0] = color.r;\n bytes[4 * n + 1] = color.g;\n bytes[4 * n + 2] = color.b;\n bytes[4 * n + 3] = color.a;\n }\n }\n}\n\nfunction
isSegmentationBoundary(\n segmentationData: Uint8Array|Int32Array,\n row: number,\n column:
number,\n width: number,\n foregroundIds: number[] = [1],\n radius = 1,\n): boolean {\n let
numberBackgroundPixels = 0;\n for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++)
{\n if (i !== 0 && j !== 0) {\n const n = (row + i) * width + (column + j);\n if
(!foregroundIds.some(id => id === segmentationData[n])) {\n numberBackgroundPixels += 1;\n }\n }\n }\n }\n return numberBackgroundPixels > 0;\n}\n\nfor (let i = 0; i < height; i += 1) {\n for (let j = 0; j
< width; j += 1) {\n const n = i * width + j;\n bytes[4 * n + 0] = background.r;\n bytes[4 * n + 1] =
background.g;\n bytes[4 * n + 2] = background.b;\n bytes[4 * n + 3] = background.a;\n for (let k = 0; k <
multiPersonOrPartSegmentation.length; k++) {\n if (foregroundIds.some(\n id => id ===
multiPersonOrPartSegmentation[k].data[n])) {\n bytes[4 * n] = foreground.r;\n bytes[4 * n + 1] =
foreground.g;\n bytes[4 * n + 2] = foreground.b;\n bytes[4 * n + 3] = foreground.a;\n const
isBoundary = isSegmentationBoundary(\n multiPersonOrPartSegmentation[k].data, i, j, width,\n foregroundIds);\n if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 && j + 1 < width
&& isBoundary) {\n drawStroke(bytes, i, j, width, 1);\n }\n }\n }\n }\n}\n\nreturn new
ImageData(bytes, width, height);\n}\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> =
[\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99],
[255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87],
[96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65,
125, 224], [84, 101, 214], [99, 81, 195]\n];\n\n/**\n * Given the output from person body part segmentation (or
multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image
with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param
partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a
SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param partColors A
multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n *
@return An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation,
with the corresponding color for each part at\n * each pixel, and black pixels where there is no part.\n */\n\nexport
function toColoredPartMask(\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n partColors:
Array<[number, number, number]> =\n RAINBOW_PART_COLORS): ImageData {\n if
(Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n return null;\n }\n\n let
multiPersonPartSegmentation;\n if (!Array.isArray(partSegmentation)) {\n multiPersonPartSegmentation =
[partSegmentation];\n } else {\n multiPersonPartSegmentation = partSegmentation;\n }\n\n const {width, height}
= multiPersonPartSegmentation[0];\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0;
i < height * width; ++i) {\n // invert mask. Invert the segmentation mask.\n const j = i * 4;\n bytes[j + 0] =
255;\n bytes[j + 1] = 255;\n bytes[j + 2] = 255;\n bytes[j + 3] = 255;\n\n for (let k = 0; k <
multiPersonPartSegmentation.length; k++) {\n const partId = multiPersonPartSegmentation[k].data[i];\n if
(partId !== -1) {\n const color = partColors[partId];\n if (!color) {\n throw new Error(`No color could
be found for part id ${partId}`);\n }\n\n bytes[j + 0] = color[0];\n bytes[j + 1] = color[1];\n bytes[j +
2] = color[2];\n bytes[j + 3] = 255;\n }\n }\n }\n\n return new ImageData(bytes, width, height);\n}\n\nconst
CANVAS_NAMES = {\n blurred: 'blurred',\n blurredMask: 'blurred-mask',\n mask: 'mask',\n lowresPartMask:
'lowres-part-mask',\n};\n\n/**\n * Given an image and a maskImage of type ImageData, draws the image with the\n *
mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The
original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this
should be\n * generated by toMask or toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask
when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param

```

```

maskBlurAmount How many pixels to blur the mask by. Defaults to 0.
 * Should be an integer between 0 and 20.
 *
 * @param flipHorizontal If the result should be flipped horizontally. Defaults
 * to false.
 */
export function
drawMask(canvas: Canvas, image: ImageType, maskImage: ImageData|null,
 maskOpacity = 0.7,
 maskBlurAmount = 0, flipHorizontal = false) {
 const [height, width] = getInputSize(image);
 canvas.width =
width;
 canvas.height = height;

 const ctx = canvas.getContext('2d');
 ctx.save();
 if (flipHorizontal) {
 flipCanvasHorizontal(canvas);
 }
 ctx.drawImage(image, 0, 0);
 ctx.globalAlpha = maskOpacity;
 if
(maskImage) {
 assertSameDimensions({ width, height }, maskImage, 'image', 'mask');
 const mask =
renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);

 const blurredMask =
drawAndBlurImageOnOffScreenCanvas(
 mask, maskBlurAmount, CANVAS_NAMES.blurredMask);
 ctx.drawImage(blurredMask, 0, 0, width, height);
 }
 ctx.restore();
}

 * Given an image and a
maskImage of type ImageData, draws the image with the
 * pixelated mask on top of it onto a canvas.
 *
 * @param canvas The canvas to be drawn onto.
 * @param image The original image to apply the mask to.
 * @param maskImage An ImageData containing the mask. Ideally this should be
 * generated by
toColoredPartMask.
 * @param maskOpacity The opacity of the mask when drawing it on top of the
 * image. Defaults to 0.7. Should be a float between 0 and 1.
 * @param maskBlurAmount How many pixels to
blur the mask by. Defaults to 0.
 * Should be an integer between 0 and 20.
 * @param flipHorizontal If the
result should be flipped horizontally. Defaults
 * to false.
 * @param pixelCellWidth The width of each pixel
cell. Default to 10 px.
 */
export function drawPixelatedMask(canvas: Canvas, image: ImageType,
maskImage: ImageData,
 maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,
 pixelCellWidth =
10.0) {
 const [height, width] = getInputSize(image);
 assertSameDimensions({ width, height }, maskImage,
'image', 'mask');
 const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);
 const blurredMask = drawAndBlurImageOnOffScreenCanvas(
 mask, maskBlurAmount,
 CANVAS_NAMES.blurredMask);

 canvas.width = blurredMask.width;
 canvas.height =
blurredMask.height;

 const ctx = canvas.getContext('2d');
 ctx.save();
 if (flipHorizontal) {
 flipCanvasHorizontal(canvas);
 }
 const offscreenCanvas =
ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);
 const offscreenCanvasCtx =
offscreenCanvas.getContext('2d');
 offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);
 offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);
 offscreenCanvasCtx.drawImage(
 blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,
 offscreenCanvas.width,
 offscreenCanvas.height);
 ctx.imageSmoothingEnabled = false;
 ctx.drawImage(
 offscreenCanvas, 0, 0,
 offscreenCanvas.width, offscreenCanvas.height, 0, 0,
 canvas.width, canvas.height);

 // Draws vertical grid
lines that are `pixelCellWidth` apart from each other.
 for (let i = 0; i < offscreenCanvas.width; i++) {
 ctx.beginPath();
 ctx.strokeStyle = '#ffffff';
 ctx.moveTo(pixelCellWidth * i, 0);
 ctx.lineTo(pixelCellWidth
* i, canvas.height);
 ctx.stroke();
 }

 // Draws horizontal grid lines that are `pixelCellWidth` apart from
each
 // other.
 for (let i = 0; i < offscreenCanvas.height; i++) {
 ctx.beginPath();
 ctx.strokeStyle =
'ffffff';
 ctx.moveTo(0, pixelCellWidth * i);
 ctx.lineTo(canvas.width, pixelCellWidth * i);
 ctx.stroke();
 }

 ctx.globalAlpha = 1.0 - maskOpacity;
 ctx.drawImage(image, 0, 0, blurredMask.width,
blurredMask.height);
 ctx.restore();
}

function createPersonMask(
 multiPersonSegmentation:
PersonSegmentation[]|SemanticPersonSegmentation,
 edgeBlurAmount: number): Canvas {
 const
backgroundMaskImage = toMask(
 multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},
 {r: 0, g: 0, b: 0, a:
0});
 const backgroundMask =
renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);
 if (edgeBlurAmount === 0) {
 return backgroundMask;
 } else {
 return
drawAndBlurImageOnOffScreenCanvas(
 backgroundMask, edgeBlurAmount,
 CANVAS_NAMES.blurredMask);
 }
}

 * Given a personSegmentation and an image, draws the image
with its background
 * blurred onto the canvas.
 *
 * @param canvas The canvas to draw the background-blurred
image onto.
 * @param image The image to blur the background of and draw.
 * @param
personSegmentation A SemanticPersonSegmentation or an array of
 * PersonSegmentation object.
 * @param
backgroundBlurAmount How many pixels in the background blend into each
 * other. Defaults to 3. Should be an

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integer between 1 and 20.\n * \n * @param edgeBlurAmount How many pixels to blur on the edge between the
person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n * \n * @param
flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n * ^\nexport function
drawBokehEffect(\n canvas: Canvas, image: ImageType,\n multiPersonSegmentation:
SemanticPersonSegmentation|PersonSegmentation[],\n backgroundBlurAmount = 3, edgeBlurAmount = 3,
flipHorizontal = false) {\n const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n image,
backgroundBlurAmount, CANVAS_NAMES.blurred);\n canvas.width = blurredImage.width;\n canvas.height =
blurredImage.height;\n const ctx = canvas.getContext('2d');\n\n if (Array.isArray(multiPersonSegmentation)
&&\n multiPersonSegmentation.length === 0) {\n ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if
(flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const
[height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The
existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else
is made\n // transparent.\"\n // crop what's not the person using the mask from the original image\n
drawWithCompositing(ctx, personMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is
kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // draw the blurred background on top of the original image where it doesn't\n // overlap.\n
drawWithCompositing(ctx, blurredImage, 'destination-over');\n ctx.restore();\n }\n\nfunction
createBodyPartMask(\n multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n
bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n const backgroundMaskImage = toMask(\n
multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n\n
const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n * \n * @param canvas The canvas to draw the background-blurred
image onto.\n * \n * @param image The image to blur the background of and draw.\n * \n * @param
partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation object.\n * \n * @param
bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be
one of the 24 body part ids.\n * \n * @param backgroundBlurAmount How many pixels in the background blend into
each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n * \n * @param edgeBlurAmount How many
pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer
between 0 and 20.\n * \n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to
false.\n * ^\nexport function blurBodyPart(\n canvas: Canvas, image: ImageType,\n partSegmentation:
SemanticPartSegmentation|PartSegmentation[],\n bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
edgeBlurAmount = 3,\n flipHorizontal = false) {\n const blurredImage =
drawAndBlurImageOnOffScreenCanvas(\n image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n\n canvas.width = blurredImage.width;\n canvas.height = blurredImage.height;\n\n const ctx =
canvas.getContext('2d');\n\n if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n
ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const bodyPartMask =\n createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);\n\n ctx.save();\n if (flipHorizontal)
{\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const [height, width] =
getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The existing canvas
content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // crop what's not the person using the mask from the original image\n drawWithCompositing(ctx,
bodyPartMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is kept where both the\n //
new shape and existing canvas content overlap. Everything else is made\n // transparent.\"\n // draw the blurred
background on top of the original image where it doesn't\n // overlap.\n drawWithCompositing(ctx, blurredImage,

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'destination-over');\n ctx.restore();\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

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=====\n*\n\n// method copied from bGlor in https://codepen.io/zhaojun/pen/zZmRQe\nexport function cpuBlur(\n canvas: HTMLCanvasElement|OffscreenCanvas,\n image:\n HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,\n blur: number) {\n const\n ctx = canvas.getContext('2d');\n let sum = 0;\n const delta = 5;\n const alphaLeft = 1 / (2 * Math.PI * delta * delta);\n const step = blur < 3 ? 1 : 2;\n for (let y = -blur; y <= blur; y += step) {\n for (let x = -blur; x <= blur; x += step) {\n const weight =\n alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));\n sum += weight;\n }\n }\n for (let y = -blur; y <= blur; y += step) {\n for (let x = -blur; x <= blur; x += step) {\n ctx.globalAlpha = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;\n ctx.drawImage(image, x, y);\n }\n }\n ctx.globalAlpha = 1;\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nexport const PART_CHANNELS: string[] = [\n 'left_face',\n 'right_face',\n 'left_upper_arm_front',\n 'left_upper_arm_back',\n 'right_upper_arm_front',\n 'right_upper_arm_back',\n 'left_lower_arm_front',\n 'left_lower_arm_back',\n 'right_lower_arm_front',\n 'right_lower_arm_back',\n 'left_hand',\n 'right_hand',\n 'torso_front',\n 'torso_back',\n 'left_upper_leg_front',\n 'left_upper_leg_back',\n 'right_upper_leg_front',\n 'right_upper_leg_back',\n 'left_lower_leg_front',\n 'left_lower_leg_back',\n 'right_lower_leg_front',\n 'right_lower_leg_back',\n 'left_feet',\n 'right_feet\n];\n","/**\n * @license See the LICENSE file. *\n\n// This code is auto-generated, do not modify this file!\nconst version = '2.2.0';\nexport {version};\n","names":["toFlattenedOneHotPartMap", "partHeatmapScores", "numParts", "shape", "partMapLocations", "tf.argmax", "partMapFlattened", "tf.reshape", "tf.oneHot", "toMaskTensor", "segmentScores", "threshold", "tf.tidy", "tf.cast", "tf.greater", "tf.scalar", "decodePartSegmentation", "segmentationMask", "_a", "partMapHeight", "partMapWidth", "image", "mask", "flattenedMap", "partNumbers", "tf.expandDims", "tf.range", "tf.matmul", "partMap", "partMapShiftedUpForClipping", "tf.add", "tf.sub", "tf.mul", "model", "outputStride", "this", "inputShape", "inputs", "tf.util", "assert", "BaseModel", "input", "asFloat", "_this", "preprocessInput", "asBatch", "results3d", "predict", "map", "y", "tf.squeeze", "namedResults", "nameOutputResults", "heatmapScores", "tf.sigmoid", "heatmap", "offsets", "displacementFwd", "displacementBwd", "segmentation", "partHeatmaps", "longOffsets", "partOffsets", "dispose", "__extends", "MobileNet", "tf.div", "results", "PART_NAMES", "NUM_KEYPOINTS", "length", "PART_IDS", "reduce", "result", "jointName", "i", "jointNameA", "jointNameB", "getScale", "_b", "padding", "height", "width", "inputResolutionY", "inputResolutionX", "padT", "padB", "getOffsetPoint", "x", "keypoint", "get", "getImageCoords", "part", "heatmapX", "heatmapY", "clamp", "a", "min", "max", "addVectors", "b", "computeDistance", "embedding", "pose", "minPartScore", "distance", "numKpt", "p", "keypoints", "score", "Math", "position", "Infinity", "getEmbedding", "location", "keypointIndex", "convertToPosition", "outputResolutionX", "refineSteps", "newLocation", "nn", "dy", "dx", "t", "newPos", "nn_1", "matchEmbeddingToInstance", "poses", "numKptForMatching", "_c", "stride", "padL", "scaleX", "scaleY", "embed", "pair", "round", "convertToPositionInOutput", "keypointsIndex", "push", "kMin", "kMinDist", "k", "dist", "getOutputResolution", "decodeMultipleMasksWebGl", "posesAboveScore", "minKptScore", "maxNumPeople", "inHeight", "inWidth", "origHeight", "origWidth", "slice", "outHeight"]
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,OAElBD,EACFD,GAaUG,EAAGC,IAASmE,EAaUC,GAaUtE,GAD5CoD,OAAQC,OAERhB,EACL2B,GAAG  
BK,EAaUC,GAaUpB,MACICvD,EAAl,EAAGA,EAAlM,EAAGN,GAAGC,EAC/B,IAAK,IAAl0H,EAAl,EAAGA  
,EAAlnH,EAaOmH,GAAGC,EAAG,CACjC,IAAMC,EAAl3H,EAAlO,EAAGmH,EAETb,GAaA,IADA1I,EAaA2I,  
GACV,CACd,IAAM1D,EAaOd,GACrC,EAAG6G,EAAGpJ,EAAG0B,GAAlD,EAaAQF,EAAlBIB,GAC3C3C,E  
AAM8C,IAAQc,EAAGC,GAASHb,GAaOBpC,EAAGC,GAC5DgD,EAAGZ,GACRsB,GAAGC,IACVuD,EAaWv  
D,GAAM0D,GAAGC,IAM9B,EAaOH,EEvEqBI,CACtBN,EAAMBC,EAAlBhD,EAAlBjE,EAAGC,EAC7DgD,GA  
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Found in path(s):

\* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/body-pix.min.js.map

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"body-pix.esm.js","sources":["../src/decode_part_map.ts","../src/base_model.ts","../src/mobilenet.ts","../src/keypoints.ts","../src/multi_person/util.ts","../src/multi_person/decode_multiple_masks_cpu.ts","../src/multi_person/decode_multiple_masks_webgl.ts","../src/multi_person/decode_instance_masks.ts","../src/multi_person/max_heap.ts","../src/multi_person/build_part_with_score_queue.ts","../src/multi_person/decode_pose.ts","../src/multi_person/decode_multiple_poses.ts","../src/resnet.ts","../src/saved_models.ts","../src/util.ts","../src/body_pix_model.ts","../src/blur.ts","../src/output_rendering_util.ts","../src/part_channels.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

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=====\n *\nimport * as tf from '@tensorflow/tfjs-core';\n\n/**\n * Takes the sigmoid of the part heatmap output and generates a 2d one-hot\n * tensor with ones where the part's score has the maximum value.\n */\n@param partHeatmapScores\nfunction toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n const numParts = partHeatmapScores.shape[2];\n const partMapLocations = tf.argmax(partHeatmapScores, 2);\n const partMapFlattened = tf.reshape(partMapLocations, [-1]);\n return tf.oneHot(partMapFlattened, numParts) as tf.Tensor2D;\n}\n\nfunction clipByMask2d(image: tf.Tensor2D, mask: tf.Tensor2D): tf.Tensor2D {\n return tf.mul(image, mask);\n}\n\n/**\n * Takes the sigmoid of the segmentation output, and generates a segmentation\n * mask with a 1 or 0 at each pixel where there is a person or not a person. The\n * segmentation threshold determines the threshold of a score for a pixel for it\n * to be considered part of a person.\n */\n@param segmentScores A 3d-tensor of the sigmoid of the segmentation output.\n@param segmentationThreshold The minimum that segmentation values must have\n * to be considered part of the person. Affects the generation of the\n */
```

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segmentation mask and the clipping of the colored part image.
 * @returns A segmentation mask with a 1 or 0
at each pixel where there is a person or not a person.
 * ^\nextport function toMaskTensor(
segmentScores:
tf.Tensor2D, threshold: number): tf.Tensor2D {
return tf.tidy(() => (tf.cast(tf.greater(
segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));
}
 * Takes the sigmoid of the person and
part map output, and returns a 2d tensor
 * of an image with the corresponding value at each pixel corresponding to
the part with the highest value. These part ids are clipped by the segmentation
 * mask. Wherever the a pixel is
clipped by the segmentation mask, its value
 * will set to -1, indicating that there is no part in that pixel.
 *
@param segmentScores A 3d-tensor of the sigmoid of the segmentation output.
 * @param partHeatmapScores A
3d-tensor of the sigmoid of the part heatmap
 * output. The third dimension corresponds to the part.
 *
@returns A 2d tensor of an image with the corresponding value at each pixel
 * corresponding to the part with the
highest value. These part ids are clipped
 * by the segmentation mask. It will have values of -1 for pixels that are
 * outside of the body and do not have a corresponding part.
 * ^\nextport function decodePartSegmentation(
segmentationMask: tf.Tensor2D,
partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
const [partMapHeight,
partMapWidth, numParts] = partHeatmapScores.shape;
return tf.tidy(() => {
const flattenedMap =
toFlattenedOneHotPartMap(partHeatmapScores);
const partNumbers = tf.expandDims(tf.range(0, numParts, 1,
'int32'), 1);
const partMapFlattened =
tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D),
'int32');
const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);
const
partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));
return tf.sub(clipByMask2d(
partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask)
, tf.scalar(1, 'int32'));
});
}
 * ^\nextport
function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D):
tf.Tensor2D {
const
[partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;
return tf.tidy(() => {
const
flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);
const partNumbers =
tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);
const partMapFlattened =
tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');
return tf.reshape(partMapFlattened,
[partMapHeight, partMapWidth]);
});
}
}
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 *
=====
 *
 * \nimport * as tfconv from '@tensorflow/tfjs-converter';
 * \nimport * as tf from '@tensorflow/tfjs-core';
 * \nimport
{BodyPixOutputStride} from './types';
 * \n * BodyPix supports using various convolution neural network
models
 * (e.g. ResNet and MobileNetV1) as its underlying base model.
 * The following BaseModel interface
defines a unified interface for
 * creating such BodyPix base models. Currently both MobileNet (in
 *
./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel
 * interface. New base models that conform
to the BaseModel interface can be
 * added to BodyPix.
 * ^\nextport abstract class BaseModel {
constructor(
protected readonly model: tfconv.GraphModel,
public readonly outputStride: BodyPixOutputStride) {
const inputShape =
this.model.inputs[0].shape as [number, number, number, number];
tf.util.assert(
(inputShape[1] === -1) && (inputShape[2] === -1),
() => `Input shape [${inputShape[1]}, ${inputShape[2]}]
` +
` must both be equal to or -1`);
}
 * \n abstract preprocessInput(input: tf.Tensor3D): tf.Tensor3D;
 * \n
 / **
 * Predicts intermediate Tensor representations.
 * \n * @param input The input RGB image of the base
model.
 * \n * A Tensor of shape: [inputResolution, inputResolution, 3].
 * \n * @return A dictionary of base
model's intermediate predictions.
 * \n * The returned dictionary should contains the following elements:
 * \n * -
heatmapScores: A Tensor3D that represents the keypoint heatmap scores.
 * \n * - offsets: A Tensor3D that represents
the offsets.
 * \n * - displacementFwd: A Tensor3D that represents the forward displacement.
 * \n * -
displacementBwd: A Tensor3D that represents the backward displacement.
 * \n * - segmentation: A Tensor3D that

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represents the segmentation of all\n * people.\n * - longOffsets: A Tensor3D that represents the long offsets used
for\n * instance grouping.\n * - partHeatmaps: A Tensor3D that represents the body part segmentation.\n *^\n
predict(input: tf.Tensor3D): {\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd:
tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n
longOffsets: tf.Tensor3D,\n partOffsets: tf.Tensor3D\n } {\n return tf.tidy(() => {\n const asFloat =
this.preprocessInput(tf.cast(input, 'float32'));\n const asBatch = tf.expandDims(asFloat, 0);\n const results =
this.model.predict(asBatch) as tf.Tensor4D[];\n const results3d: tf.Tensor3D[] = results.map(y => tf.squeeze(y,
[0]));\n const namedResults = this.nameOutputResults(results3d);\n\n return {\n heatmapScores:
tf.sigmoid(namedResults.heatmap),\n offsets: namedResults.offsets,\n displacementFwd:
namedResults.displacementFwd,\n displacementBwd: namedResults.displacementBwd,\n segmentation:
namedResults.segmentation,\n partHeatmaps: namedResults.partHeatmaps,\n longOffsets:
namedResults.longOffsets,\n partOffsets: namedResults.partOffsets\n };;\n });;\n }\n\n // Because
MobileNet and ResNet predict() methods output a different order for\n // these values, we have a method that needs
to be implemented to order them.\n abstract nameOutputResults(results: tf.Tensor3D[]): {\n heatmap:
tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n
segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n partOffsets:
tf.Tensor3D\n };\n\n /**\n * Releases the CPU and GPU memory allocated by the model.\n */\n dispose() {\n
this.model.dispose();\n }\n}\n\n", /**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n *
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====^\n
*/\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BaseModel } from './base_model';\n\nexport class
MobileNet extends BaseModel {\n preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n // Normalize the pixels
[0, 255] to be between [-1, 1].\n return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n }\n\n
nameOutputResults(results: tf.Tensor3D[]) {\n const [\n offsets,\n segmentation,\n partHeatmaps,\n
longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets,\n] = results;\n
return {\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n
displacementFwd,\n displacementBwd,\n partOffsets\n };;\n }\n}\n\n", /**\n * @license\n * Copyright 2019
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=====^\n
*/\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple =
Tuple<number>;\n\nexport const PART_NAMES = [\n 'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',
'leftShoulder',\n 'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n 'leftHip', 'rightHip', 'leftKnee',
'rightKnee', 'leftAnkle', 'rightAnkle'\n];\n\nexport const NUM_KEYPOINTS = PART_NAMES.length;\n\nexport
interface NumberDict {\n [jointName: string]: number;\n}\n\nexport const PART_IDS =\n PART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n result[jointName] = i;\n
return result;\n }, {});\n\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n ['leftHip', 'leftShoulder'],
['leftElbow', 'leftShoulder'],\n ['leftElbow', 'leftWrist'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['rightHip',
'rightShoulder'],\n ['rightElbow', 'rightShoulder'], ['rightElbow', 'rightWrist'],\n ['rightHip', 'rightKnee'],

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['rightKnee', 'rightAnkle'],\n ['leftShoulder', 'rightShoulder'], ['leftHip', 'rightHip']\n);\n\n * Define the skeleton.
This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree,
however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the
tree root as any node.\n */\nexport const POSE_CHAIN: StringTuple[] = [\n ['nose', 'leftEye'], ['leftEye', 'leftEar'],
['nose', 'rightEye'],\n ['rightEye', 'rightEar'], ['nose', 'leftShoulder'],\n ['leftShoulder', 'leftElbow'], ['leftElbow',
'leftWrist'],\n ['leftShoulder', 'leftHip'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['nose', 'rightShoulder'],\n
['rightShoulder', 'rightElbow'], ['rightElbow', 'rightWrist'],\n ['rightShoulder', 'rightHip'], ['rightHip', 'rightKnee'],\n
['rightKnee', 'rightAnkle']\n);\n\nexport const CONNECTED_PART_INDICES =
CONNECTED_PART_NAMES.map(\n ([jointNameA, jointNameB]) =>\n ([PART_IDS[jointNameA],
PART_IDS[jointNameB]]);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from
 './types';\n\nexport function getScale(\n [height, width]: [number, number],\n [inputResolutionY,
inputResolutionX]: [number, number],\n padding: Padding): [number, number] {\n const {top: padT, bottom:
padB, left: padL, right: padR} = padding;\n const scaleY = inputResolutionY / (padT + padB + height);\n const
scaleX = inputResolutionX / (padL + padR + width);\n return [scaleX, scaleY];\n}\n\nexport function
getOffsetPoint(\n y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n return {\n
y: offsets.get(y, x, keypoint),\n x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n };\n}\n\nexport function
getImageCoords(\n part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n const {heatmapY,
heatmapX, id: keypoint} = part;\n const {y, x} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n return
{\n x: part.heatmapX * outputStride + x,\n y: part.heatmapY * outputStride + y\n };\n}\n\nexport function
fillArray<T>(element: T, size: number): T[] {\n const result: T[] = new Array(size);\n\n for (let i = 0; i < size; i++)
{\n result[i] = element;\n }\n\n return result;\n}\n\nexport function clamp(a: number, min: number, max:
number): number {\n if (a < min) {\n return min;\n }\n if (a > max) {\n return max;\n }\n return
a;\n}\n\nexport function squaredDistance(\n y1: number, x1: number, y2: number, x2: number): number {\n const
dy = y2 - y1;\n const dx = x2 - x1;\n return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b:
Vector2D): Vector2D {\n return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min:
number, max: number): Vector2D {\n return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n\n *
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the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\n\nimport
 {getScale} from './util';\n\ninterface Pair {\n x: number;\n y: number;\n}\n\nfunction computeDistance(embedding:
Pair[], pose: Pose, minPartScore = 0.3) {\n let distance = 0.0;\n let numKpt = 0;\n for (let p = 0; p <
embedding.length; p++) {\n if (pose.keypoints[p].score > minPartScore) {\n numKpt += 1;\n distance +=
(embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n (embedding[p].y - pose.keypoints[p].position.y) **
2;\n }\n }\n\n if (numKpt === 0) {\n distance = Infinity;\n } else {\n distance = distance / numKpt;\n }\n\n
return distance;\n}\n\nfunction convertToPositionInOutput(\n position: Pair, [padT, padL]: [number, number],\n

```

```

[scaleX, scaleY]: [number, number], stride: number): Pair {\n
 const y = Math.round(((padT + position.y + 1.0) *
 scaleY - 1.0) / stride);\n
 const x = Math.round(((padL + position.x + 1.0) *
 scaleX - 1.0) / stride);\n
 return {x,
 y};\n
}\n
\n
function getEmbedding(\n
 location: Pair, keypointIndex: number,\n
 convertToPosition: (pair: Pair) =>
 Pair, outputResolutionX: number,\n
 longOffsets: Float32Array, refineSteps: number,\n
 [height, width]: [number,
 number]): Pair {\n
 const newLocation = convertToPosition(location);\n
 const nn = newLocation.y *
 outputResolutionX + newLocation.x;\n
 let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n
 let dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n
 let y = location.y + dy;\n
 let x =
 location.x + dx;\n
 for (let t = 0; t < refineSteps; t++) {\n
 y = Math.min(y, height - 1);\n
 x = Math.min(x, width -
 1);\n
 const newPos = convertToPosition({x, y});\n
 const nn = newPos.y * outputResolutionX + newPos.x;\n
 dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n
 dx = longOffsets[NUM_KEYPOINTS * (2
 * nn + 1) + keypointIndex];\n
 y = y + dy;\n
 x = x + dx;\n
 }\n
 return {x, y};\n
}\n
\n
function
 matchEmbeddingToInstance(\n
 location: Pair, longOffsets: Float32Array, poses: Pose[],\n
 numKptForMatching:
 number, [padT, padL]: [number, number],\n
 [scaleX, scaleY]: [number, number], outputResolutionX: number,\n
 [height, width]: [number, number], stride: number,\n
 refineSteps: number): number {\n
 const embed: Pair[] = [];\n
 const convertToPosition = (pair: Pair) =>\n
 convertToPositionInOuput(pair, [padT, padL], [scaleX, scaleY],
 stride);\n
 for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;\n
 keypointsIndex++) {\n
 const embedding = getEmbedding(\n
 location, keypointsIndex, convertToPosition, outputResolutionX,\n
 longOffsets, refineSteps, [height, width]);\n
 embed.push(embedding);\n
 }\n
 let kMin = -1;\n
 let kMinDist =
 Infinity;\n
 for (let k = 0; k < poses.length; k++) {\n
 const dist = computeDistance(embed, poses[k]);\n
 if (dist <
 kMinDist) {\n
 kMin = k;\n
 kMinDist = dist;\n
 }\n
 }\n
 return kMin;\n
}\n
\n
function getOutputResolution(\n
 [inputResolutionY, inputResolutionX]: [number, number],\n
 stride: number): [number, number] {\n
 const
 outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n
 const outputResolutionY =
 Math.round((inputResolutionY - 1.0) / stride + 1.0);\n
 return [outputResolutionX, outputResolutionY];\n
}\n
\n
export
 function decodeMultipleMasksCPU(\n
 segmentation: Uint8Array, longOffsets: Float32Array,\n
 posesAboveScore: Pose[], height: number, width: number, stride: number,\n
 [inHeight, inWidth]: [number,
 number], padding: Padding,\n
 refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n
 const dataArrays
 =\n
 posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n
 const {top: padT, left: padL} =
 padding;\n
 const [scaleX, scaleY] =\n
 getScale([height, width], [inHeight, inWidth], padding);\n
 const
 [outputResolutionX,] =\n
 getOutputResolution([inHeight, inWidth], stride);\n
 for (let i = 0; i < height; i += 1) {\n
 for (let j = 0; j < width; j += 1) {\n
 const n = i * width + j;\n
 const prob = segmentation[n];\n
 if (prob ===
 1) {\n
 const kMin = matchEmbeddingToInstance(\n
 {x: j, y: i}, longOffsets, posesAboveScore,\n
 numKptForMatching,\n
 [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n
 stride,\n
 refineSteps);\n
 if (kMin >= 0) {\n
 dataArrays[kMin][n] = 1;\n
 }\n
 }\n
 }\n
 }\n
 return
 dataArrays;\n
}\n
\n
export
 function decodeMultiplePartMasksCPU(\n
 segmentation: Uint8Array, longOffsets:
 Float32Array,\n
 partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,\n
 width: number,
 stride: number, [inHeight, inWidth]: [number, number],\n
 padding: Padding, refineSteps: number,\n
 numKptForMatching = 5): Int32Array[] {\n
 const dataArrays =\n
 posesAboveScore.map(x => new
 Int32Array(height * width).fill(-1));\n
 const {top: padT, left: padL} = padding;\n
 const [scaleX, scaleY] =\n
 getScale([height, width], [inHeight, inWidth], padding);\n
 const [outputResolutionX,] =\n
 getOutputResolution([inHeight, inWidth], stride);\n
 for (let i = 0; i < height; i += 1) {\n
 for (let j = 0; j < width; j
 += 1) {\n
 const n = i * width + j;\n
 const prob = segmentation[n];\n
 if (prob === 1) {\n
 const kMin =
 matchEmbeddingToInstance(\n
 {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,\n
 [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n
 stride, refineSteps);\n
 if (kMin >=
 0) {\n
 dataArrays[kMin][n] = partSegmentaion[n];\n
 }\n
 }\n
 }\n
 }\n
 return
 dataArrays;\n
}\n
\n
"/**\n
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```

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```
=====\n*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-webgl';\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Pose} from '../types';\nimport {getScale} from './util';\n\nexport function decodeMultipleMasksWebGl(\n segmentation: tf.Tensor2D,\n longOffsets: tf.Tensor3D,\n posesAboveScore: Pose[],\n height: number,\n width: number,\n stride: number,\n [inHeight, inWidth]: [number, number],\n padding: Padding,\n refineSteps: number,\n minKptScore: number,\n maxNumPeople: number): tf.TensorInfo {\n // The height/width of the image/canvas itself.\n const [origHeight, origWidth] = segmentation.shape;\n // The height/width of the output of the model.\n const [outHeight, outWidth] = longOffsets.shape.slice(0, 2);\n const shapedLongOffsets: tf.Tensor4D =\n tf.reshape(longOffsets, [outHeight, outWidth, 2, NUM_KEYPOINTS]);\n // Make pose tensor of shape [MAX_NUM_PEOPLE, NUM_KEYPOINTS, 3] where\n // the last 3 coordinates correspond to the score, h and w coordinate of that\n // keypoint.\n const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i = 0; i < posesAboveScore.length; i++) {\n const poseOffset = i * NUM_KEYPOINTS * 3;\n const pose = posesAboveScore[i];\n for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n const keypoint = pose.keypoints[kp];\n const offset = poseOffset + kp * 3;\n poseVals[offset] = keypoint.score;\n poseVals[offset + 1] = keypoint.position.y;\n poseVals[offset + 2] = keypoint.position.x;\n }\n }\n const [scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n const posesTensor =\n tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n const {top: padT, left: padL} = padding;\n const program: tf_webgl.GPGPUProgram = {\n variableNames: ['segmentation', 'longOffsets', 'poses'],\n outputShape: [origHeight, origWidth],\n userCode: `\n int convertToPositionInOut(float pos, int pad, float\n scale, int stride) {\n return round(((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n }\n\n float\n convertToPositionInOutFloat(\n int pos, int pad, float scale, int stride) {\n return ((float(pos + pad) + 1.0)\n * scale - 1.0) / float(stride);\n }\n\n float dist(float x1, float y1, float x2, float y2) {\n return pow(x1 - x2, 2.0)\n + pow(y1 - y2, 2.0);\n }\n\n float sampleLongOffsets(float h, float w, int d, int k) {\n float fh = fract(h);\n float fw = fract(w);\n int clH = int(ceil(h));\n int clW = int(ceil(w));\n int flH = int(floor(h));\n int flW = int(floor(w));\n float o11 = getLongOffsets(flH, flW, d, k);\n float o12 = getLongOffsets(flH, clW, d, k);\n float o21 = getLongOffsets(clH, flW, d, k);\n float o22 = getLongOffsets(clH, clW, d, k);\n float o1 =\n mix(o11, o12, fw);\n float o2 = mix(o21, o22, fw);\n return mix(o1, o2, fh);\n }\n\n int\n findNearestPose(int h, int w) {\n float prob = getSegmentation(h, w);\n if (prob < 1.0) {\n return -1;\n }\n\n // Done(Tyler): convert from output space h/w to strided space.\n float stridedH =\n convertToPositionInOutFloat(\n h, ${padT}, ${scaleY}, ${stride});\n float stridedW =\n convertToPositionInOutFloat(\n w, ${padL}, ${scaleX}, ${stride});\n float minDist = 1000000.0;\n int iMin = -1;\n for (int i = 0; i < ${maxNumPeople}; i++) {\n float curDistSum = 0.0;\n int numKpt = 0;\n for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n float dy = sampleLongOffsets(stridedH,\n stridedW, 0, k);\n float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n float y = float(h) + dy;\n float x = float(w) + dx;\n for (int s = 0; s < ${refineSteps}; s++) {\n int yRounded = round(min(y,\n float(${height} - 1.0));\n int xRounded = round(min(x, float(${width} - 1.0)));\n float yStrided =\n convertToPositionInOutFloat(\n yRounded, ${padT}, ${scaleY}, ${stride});\n float xStrided =\n convertToPositionInOutFloat(\n xRounded, ${padL}, ${scaleX}, ${stride});\n float dy =\n sampleLongOffsets(yStrided, xStrided, 0, k);\n float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n y = y + dy;\n x = x + dx;\n }\n float poseScore = getPoses(i, k, 0);\n float poseY =\n getPoses(i, k, 1);\n float poseX = getPoses(i, k, 2);\n if (poseScore > ${minKptScore}) {\n numKpt = numKpt + 1;\n curDistSum = curDistSum + dist(x, y, poseX, poseY);\n }\n }\n if\n (numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n minDist = curDistSum / float(numKpt);\n iMin = i;\n }\n }\n return iMin;\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n }\n `;\n}
```



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int nearestPose = findNearestPose(coords[0], coords[1]);\n setOutput(float(nearestPose));\n }\n }\n};\n\nconst WebGLBackend = tf.backend() as tf_webgl.MathBackendWebGL;\nreturn WebGLBackend.compileAndRun(\n program, [segmentation, shapedLongOffsets, posesTensor]);\n}\n"/**\n * @license\n * Copyright 2019 Google\n Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n=====\n\n*/\nimport * as tf from 'tensorflow/tfjs-core';\nimport {getBackend} from 'tensorflow/tfjs-core';\nimport\n {Padding, PartSegmentation, PersonSegmentation, Pose} from './types';\nimport {decodeMultipleMasksCPU,\n decodeMultiplePartMasksCPU} from './decode_multiple_masks_cpu';\nimport {decodeMultipleMasksWebGL} from\n './decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n segmentation: tf.Tensor2D, k:\n number): tf.Tensor2D {\n return tf.tidy(() => (tf.cast(tf.equal(\n segmentation, tf.scalar(k), 'int32') as\n tf.Tensor2D));\n})\n\nexport function toPersonKPartSegmentation(\n segmentation: tf.Tensor2D, bodyParts:\n tf.Tensor2D, k: number): tf.Tensor2D {\n return tf.tidy(() => tf.sub(tf.mul(tf.cast(tf.equal(\n segmentation, tf.scalar(k), 'int32'), tf.add(bodyParts, 1)), 1));\n})\n\nfunction isWebGLBackend() {\n return\n getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n segmentation:\n tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n height: number, width: number, stride: number, [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n refineSteps = 8,\n minKeypointScore = 0.3, maxNumPeople = 10): Promise<PersonSegmentation[]> {\n // Filter out poses with\n smaller score.\n const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n let\n personSegmentationsData: Uint8Array[];\n if (isWebGLBackend()) {\n const personSegmentations = tf.tidy(()\n => {\n const masksTensorInfo = decodeMultipleMasksWebGL(\n segmentation, longOffsets,\n posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps, minKeypointScore, \n maxNumPeople);\n const masksTensor = tf.engine().makeTensorFromDataId(\n masksTensorInfo.dataId,\n masksTensorInfo.shape, \n masksTensorInfo.dtype) as tf.Tensor2D;\n return posesAboveScore.map(\n (_, k) => toPersonKSegmentation(masksTensor, k));\n });\n personSegmentationsData =\n (await\n Promise.all(personSegmentations.map(mask => mask.data()))) as\n Uint8Array[];\n } else {\n const segmentationsData = await\n segmentation.data() as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n personSegmentationsData = decodeMultipleMasksCPU(\n segmentationsData, longOffsetsData,\n posesAboveScore, height, width, \n stride, [inHeight, inWidth], padding, refineSteps);\n }\n return\n personSegmentationsData.map((data, i) => ({data, pose: posesAboveScore[i], width, height});\n)\n\nexport\n async function decodePersonInstancePartMasks(\n segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, \n partSegmentation: tf.Tensor2D, poses: Pose[], height: number, width: number, \n stride: number, [inHeight, inWidth]: [number, number], padding: Padding, \n minPoseScore = 0.2, refineSteps = 8, minKeypointScore =\n 0.3, \n maxNumPeople = 10): Promise<PartSegmentation[]> {\n const posesAboveScore = poses.filter(pose =>\n pose.score >= minPoseScore);\n let partSegmentationsByPersonData: Int32Array[];\n if (isWebGLBackend())\n {\n const partSegmentations = tf.tidy(() => {\n const masksTensorInfo = decodeMultipleMasksWebGL(\n segmentation, longOffsets, posesAboveScore, height, width, stride, \n [inHeight, inWidth], padding,\n refineSteps, minKeypointScore, \n maxNumPeople);\n const masksTensor =\n tf.engine().makeTensorFromDataId(\n masksTensorInfo.dataId, masksTensorInfo.shape, \n masksTensorInfo.dtype) as tf.Tensor2D;\n return posesAboveScore.map(\n (_, k) =>\n toPersonKPartSegmentation(masksTensor, partSegmentation, k));\n });\n partSegmentationsByPersonData =\n (await Promise.all(partSegmentations.map(x => x.data()))) as\n Int32Array[];\n } else {\n const segmentationsData = await segmentation.data()\n

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as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n const
partSegmentaionData = await partSegmentation.data() as Uint8Array;\n\n partSegmentationsByPersonData =
decodeMultiplePartMasksCPU(\n segmentationsData, longOffsetsData, partSegmentaionData,\n posesAboveScore, height, width, stride, [inHeight, inWidth], padding,\n refineSteps);\n }\n\n return
partSegmentationsByPersonData.map(\n (data, k) => ({pose: posesAboveScore[k], data, height,
width}));\n}\n", "/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n//
https://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n return
Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n private priorityQueue: T[];\n private numberOfElements:
number;\n private getElementValue: (element: T) => number;\n\n constructor(maxSize: number, getElementValue:
(element: T) => number) {\n this.priorityQueue = new Array(maxSize);\n this.numberOfElements = -1;\n this
.getElementValue = getElementValue;\n }\n\n public enqueue(x: T): void {\n this
.priorityQueue[++this.numberOfElements] = x;\n this.swim(this.numberOfElements);\n }\n\n public
dequeue(): T {\n const max = this.priorityQueue[0];\n this.exchange(0, this.numberOfElements--);\n this
.sink(0);\n this.priorityQueue[this.numberOfElements + 1] = null;\n return max;\n }\n\n public empty():
boolean {\n return this.numberOfElements === -1;\n }\n\n public size(): number {\n return
this.numberOfElements + 1;\n }\n\n public all(): T[] {\n return this.priorityQueue.slice(0, this.numberOfElements
+ 1);\n }\n\n public max(): T {\n return this.priorityQueue[0];\n }\n\n private swim(k: number): void {\n while
(k > 0 && this.less(half(k), k)) {\n this.exchange(k, half(k));\n k = half(k);\n }\n }\n\n private sink(k:
number): void {\n while (2 * k <= this.numberOfElements) {\n let j = 2 * k;\n if (j < this.numberOfElements
&& this.less(j, j + 1)) {\n j++;\n }\n if (!this.less(k, j)) {\n break;\n }\n this
.exchange(k, j);\n k = j;\n }\n }\n\n private getValueAt(i: number): number {\n return
this.getElementValue(this.priorityQueue[i]);\n }\n\n private less(i: number, j: number): boolean {\n return
this.getValueAt(i) < this.getValueAt(j);\n }\n\n private exchange(i: number, j: number): void {\n const t =
this.priorityQueue[i];\n this.priorityQueue[i] = this.priorityQueue[j];\n this.priorityQueue[j] = t;\n }\n}\n", "/**\n
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the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {PartWithScore, TensorBuffer3D} from '../types';\n\nimport {MaxHeap} from
'./max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n keypointId: number, score: number, heatmapY:
number, heatmapX: number,\n localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n const
[height, width] = scores.shape;\n\n let localMaximum = true;\n const yStart = Math.max(heatmapY -
localMaximumRadius, 0);\n const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n for (let
yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n const xStart = Math.max(heatmapX - localMaximumRadius,
0);\n const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n for (let xCurrent = xStart;
xCurrent < xEnd; ++xCurrent) {\n if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n localMaximum
= false;\n break;\n }\n }\n if (!localMaximum) {\n break;\n }\n }\n\n return

```

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localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a single priority queue across all parts.\n * ^\nexport function buildPartWithScoreQueue(\n scoreThreshold: number,\n localMaximumRadius: number,\n scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n const [height, width,\n numKeypoints] = scores.shape;\n const queue = new MaxHeap<PartWithScore>(\n height * width * numKeypoints, ({score}) => score);\n for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n for (let heatmapX = 0; heatmapX < width; ++heatmapX) {\n for (let keypointId = 0; keypointId < numKeypoints;\n ++keypointId) {\n const score = scores.get(heatmapY, heatmapX, keypointId);\n // Only consider parts with score greater or equal to threshold as\n // root candidates.\n if (score < scoreThreshold) {\n continue;\n }\n // Only consider keypoints whose score is maximum in a local window.\n if (scoreIsMaximumInLocalWindow(\n keypointId, score, heatmapY, heatmapX, localMaximumRadius,\n scores)) {\n queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n }\n }\n }\n }\n return queue;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n *\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';\nimport {Keypoint, PartWithScore, TensorBuffer3D, Vector2D} from './types';\nimport {clamp, getOffsetPoint} from './util';\nimport {addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] = POSE_CHAIN.map(\n ([parentJoinName, childJoinName]): NumberTuple =>\n ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);\n\nconst parentToChildEdges: number[] =\n parentChildrenTuples.map(([, childJointId]) => childJointId);\n\nconst childToParentEdges: number[] =\n parentChildrenTuples.map([\n parentJointId,\n parentJointId,\n]) =>\n parentJointId;\n\nfunction getDisplacement(\n edgeId: number, point: Vector2D, displacements: TensorBuffer3D): Vector2D {\n const numEdges = displacements.shape[2] / 2;\n return {\n y: displacements.get(point.y, point.x, edgeId),\n x: displacements.get(point.y, point.x, numEdges + edgeId)\n };\n}\n\nfunction getStridedIndexNearPoint(\n point: Vector2D, outputStride: number, height: number,\n width: number): Vector2D {\n return {\n y: clamp(Math.round(point.y / outputStride), 0, height - 1),\n x: clamp(Math.round(point.x / outputStride), 0, width - 1)\n };\n}\n\n/**\n * We get a new keypoint along the `edgeId` for the pose instance, assuming\n * that the position of the `idSource` part is already known. For this, we\n * follow the displacement vector from the source to target part (stored in\n * the `i`-t channel of the displacement tensor). The displaced keypoint\n * vector is refined using the offset vector by `offsetRefineStep` times.\n *\nfunction traverseToTargetKeypoint(\n edgeId: number, sourceKeypoint: Keypoint, targetKeypointId:\n number,\n scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride: number,\n displacements: TensorBuffer3D, offsetRefineStep = 2): Keypoint {\n const [height, width] = scoresBuffer.shape;\n // Nearest neighbor interpolation for the source->target displacements.\n const sourceKeypointIndices =\n getStridedIndexNearPoint(\n sourceKeypoint.position, outputStride, height, width);\n const displacement =\n getDisplacement(edgeId, sourceKeypointIndices, displacements);\n const displacedPoint =\n addVectors(sourceKeypoint.position, displacement);\n let targetKeypoint = displacedPoint;\n for (let i = 0; i < offsetRefineStep; i++) {\n const targetKeypointIndices =\n getStridedIndexNearPoint(targetKeypoint,\n outputStride, height, width);\n const offsetPoint = getOffsetPoint(\n targetKeypointIndices.y,\n targetKeypointIndices.x, targetKeypointId,\n offsets);\n targetKeypoint = addVectors(\n {\n x: targetKeypointIndices.x * outputStride,\n y: targetKeypointIndices.y * outputStride\n },\n {\n x: offsetPoint.x, y: offsetPoint.y\n });\n }\n const targetKeypointIndices =\n
```

```
getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n const score = scoresBuffer.get(\n targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);\n\n return {position: targetKeypoint, part:\n PART_NAMES[targetKeypointId], score};\n}\n\n/*\n * Follows the displacement fields to decode the full pose of\n the object\n * instance given the position of a part that acts as root.\n */\n @return An array of decoded keypoints\n and their scores for a single pose\n */\n\nexport function decodePose(\n root: PartWithScore, scores:\n TensorBuffer3D, offsets: TensorBuffer3D,\n outputStride: number, displacementsFwd: TensorBuffer3D,\n displacementsBwd: TensorBuffer3D): Keypoint[] {\n const numParts = scores.shape[2];\n const numEdges =\n parentToChildEdges.length;\n\n const instanceKeypoints: Keypoint[] = new Array(numParts);\n // Start a new\n detection instance at the position of the root.\n const {part: rootPart, score: rootScore} = root;\n const rootPoint =\n getImageCoords(rootPart, outputStride, offsets);\n\n instanceKeypoints[rootPart.id] = {\n score: rootScore,\n part: PART_NAMES[rootPart.id],\n position: rootPoint\n };\n\n // Decode the part positions upwards in the tree,\n following the backward\n // displacements.\n for (let edge = numEdges - 1; edge >= 0; --edge) {\n const\n sourceKeypointId = parentToChildEdges[edge];\n const targetKeypointId = childToParentEdges[edge];\n if\n (instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge,\n instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsBwd);\n }\n }\n\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let\n edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const\n targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride,\n displacementsFwd);\n }\n }\n\n return instanceKeypoints;\n}\n\n/*\n * @license\n * Copyright 2019 Google\n Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */\n\n=====\n\nimport {Keypoint, Pose, TensorBuffer3D} from '../types';\nimport {buildPartWithScoreQueue} from\n './build_part_with_score_queue';\nimport {decodePose} from './decode_pose';\nimport {getImageCoords,\n squaredDistance} from './util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],\n squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return\n poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return\n squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <= \n squaredNmsRadius;\n });\n}\n\n/*\n * Score the newly proposed object instance without taking into account\n * the\n scores of the parts that overlap with any previously detected\n * instance.\n */\n\nfunction getInstanceScore(\n existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let\n notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number =>\n {\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position,\n keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n\n return\n notOverlappedKeypointScores /= instanceKeypoints.length;\n}\n\n// A point (y, x) is considered as root part\n candidate if its score is a\n // maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n //\n kLocalMaximumRadius.\n\nconst kLocalMaximumRadius = 1;\n\n/*\n * Detects multiple poses and finds their parts\n from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in\n decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima\n above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of\n the queue (in decreasing score order)\n * and treat it as a root candidate for a new object instance. To avoid\n */
```

duplicate detections, we reject the root candidate if it is within a disk of `nmsRadius` pixels from the corresponding part of a previously detected instance, which is a form of part-based non-maximum suppression (NMS). If the root candidate passes the NMS check, we start a new object instance detection, treating the corresponding part as root and finding the positions of the remaining parts by following the displacement vectors along the tree-structured part graph. We assign to the newly detected instance a score equal to the sum of scores of its parts which have not been claimed by a previous instance (i.e., those at least `nmsRadius` pixels away from the corresponding part of all previously detected instances), divided by the total number of parts.

`heatmapScores` 3-D tensor with shape `[height, width, numParts]`. The value of `heatmapScores[y, x, k]` is the score of placing the `k`-th object part at position `(y, x)`.

`offsets` 3-D tensor with shape `[height, width, numParts * 2]`. The value of `[offsets[y, x, k], offsets[y, x, k + numParts]]` is the short range offset vector of the `k`-th object part at heatmap position `(y, x)`.

`displacementsFwd` 3-D tensor of shape `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the number of edges (parent-child pairs) in the tree. It contains the forward displacements between consecutive part from the root towards the leaves.

`displacementsBwd` 3-D tensor of shape `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the number of edges (parent-child pairs) in the tree. It contains the backward displacements between consecutive part from the root towards the leaves.

`outputStride` The output stride that was used when feed-forwarding through the PoseNet model. Must be 32, 16, or 8.

`maxPoseDetections` Maximum number of returned instance detections per image.

`scoreThreshold` Only return instance detections that have root part score greater or equal to this value. Defaults to 0.5.

`nmsRadius` Non-maximum suppression part distance. It needs to be strictly positive. Two parts suppress each other if they are less than `nmsRadius` pixels away. Defaults to 20.

`return` An array of poses and their scores, each containing keypoints and the corresponding keypoint scores.

```

@export function decodeMultiplePoses(
 scoresBuffer: TensorBuffer3D,
 offsetsBuffer: TensorBuffer3D,
 displacementsFwdBuffer: TensorBuffer3D,
 displacementsBwdBuffer: TensorBuffer3D,
 outputStride: number,
 maxPoseDetections: number,
 scoreThreshold = 0.5,
 nmsRadius = 20):
 Pose[] {
 const poses: Pose[] = [];
 const queue = buildPartWithScoreQueue(
 scoreThreshold,
 kLocalMaximumRadius,
 scoresBuffer);
 const squaredNmsRadius = nmsRadius * nmsRadius;
 // Generate at most maxDetections object instances per image in
 // decreasing root part score order.
 while (poses.length < maxPoseDetections && !queue.empty()) {
 // The top element in the queue is the next root candidate.
 const root = queue.dequeue();
 // Part-based non-maximum suppression: We reject a root candidate if it
 // is within a disk of nmsRadius pixels from the corresponding part of
 // a previously detected instance.
 const rootImageCoords =
 getImageCoords(root.part, outputStride, offsetsBuffer);
 if (withinNmsRadiusOfCorrespondingPoint(
 poses, squaredNmsRadius, rootImageCoords, root.part.id)) {
 continue;
 }
 // Start a new detection instance at the position of the root.
 const keypoints =
 decodePose(
 root, scoresBuffer, offsetsBuffer, outputStride, displacementsFwdBuffer,
 displacementsBwdBuffer);
 const score = getInstanceScore(poses, squaredNmsRadius, keypoints);
 poses.push({keypoints, score});
 }
 return poses;
 }
}

```

=====  
`import * as tf from '@tensorflow/tfjs-core';`  
`import { BaseModel } from './base_model';`  
`const imageNetMean = [-123.15, -115.90, -103.06];`  
`export class ResNet extends BaseModel {`  
 `preprocessInput(input: tf.Tensor3D): tf.Tensor3D {`  
 `return tf.add(input, imageNetMean);`  
 `}`  
 `nameOutputResults(results: tf.Tensor3D[]) {`  
 `const [displacementBwd, displacementFwd,]`

```
heatmap,\n longOffsets,\n offsets,\n partHeatmaps,\n segmentation,\n partOffsets,\n] = results;\n return {\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets\n };\n }\n}\n", "/*\n * @license\n * Copyright 2019\n Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n may not use this except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nconst RESNET50_BASE_URL =\n 'https://storage.googleapis.com/tfjs-\nmodels/savedmodel/bodypix/resnet50';\nconst MOBILENET_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet';\n\n// The BodyPix 2.0 ResNet50\nmodels use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number,\n quantBytes: number): string {\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding\n to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return RESNET50_BASE_URL +\n `float` + graphJson;\n } else {\n return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n }\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport\nfunction mobileNetSavedModel(\n stride: number, multiplier: number, quantBytes: number): string {\n const\n toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n const graphJson = `model-\nstride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if\n (quantBytes === 4) {\n return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n } else\n {\n return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n graphJson;\n }\n}\n\n", "/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache\n License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required\n by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n License for the specific language governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n\n*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {BodyPixInput, BodyPixOutputStride, Padding} from\n './types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from\n './types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\n HTMLCanvasElement|\n OffscreenCanvas): [number, number] {\n if ('offsetHeight' in input\n && input.offsetHeight !== 0\n && 'offsetWidth' in input\n && input.offsetWidth !== 0) {\n return\n [input.offsetHeight, input.offsetWidth];\n } else if (input.height !== null\n && input.width !== null) {\n return\n [input.height, input.width];\n } else {\n throw new Error(\n `HTMLImageElement must have height and\n width attributes set.`);\n }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number,\n number] {\n if (input.hasAttribute('height')\n && input.hasAttribute('width')) {\n // Prioritizes user specified height\n and width.\n // We can't test the .height and .width properties directly,\n // because they evaluate to 0 if unset.\n return [input.height, input.width];\n } else {\n return [input.videoHeight, input.videoWidth];\n }\n}\n\nexport\nfunction getInputSize(input: BodyPixInput): [number, number] {\n if ((typeof (HTMLCanvasElement) !==\n 'undefined' &&\n input instanceof HTMLCanvasElement) ||\n (typeof (OffscreenCanvas) !== 'undefined'\n &&\n input instanceof OffscreenCanvas) ||\n (typeof (HTMLImageElement) !== 'undefined' &&\n input instanceof HTMLImageElement)) {\n return\n getSizeFromImageLikeElement(input);\n } else if (typeof\n (ImageData) !== 'undefined' && input instanceof ImageData) {\n return\n [input.height, input.width];\n } else if (\n typeof (HTMLVideoElement) !== 'undefined' &&\n input instanceof HTMLVideoElement) {\n return\n getSizeFromVideoElement(input);\n } else if (input instanceof tf.Tensor) {\n return\n [input.shape[0],\n
```

```

input.shape[1]);\n } else {\n throw new Error(`error: Unknown input type: ${input}.`);\n }\n}\n\nfunction
isValidInputResolution(\n resolution: number, outputStride: number): boolean {\n return (resolution - 1) %
outputStride === 0;\n}\n\nexport function toValidInputResolution(\n inputResolution: number, outputStride:
BodyPixOutputStride): number {\n if (isValidInputResolution(inputResolution, outputStride)) {\n return
inputResolution;\n }\n return Math.floor(inputResolution / outputStride) * outputStride + 1;\n}\n\nconst
INTERNAL_RESOLUTION_STRING_OPTIONS = {\n low: 'low',\n medium: 'medium',\n high: 'high',\n full:
'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION =
0.1;\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n
internalResolution: BodyPixInternalResolution): number {\n if (typeof internalResolution === 'string') {\n const
result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n tf.util.assert(\n typeof result
=== 'number',\n () => `string value of inputResolution must be one of ${\n
Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n .join(',')\n } but was
${internalResolution}.`);\n return result;\n } else {\n tf.util.assert(\n typeof internalResolution === 'number'
&&\n internalResolution <= MAX_INTERNAL_RESOLUTION &&\n internalResolution >=
MIN_INTERNAL_RESOLUTION,\n () =>`\n `inputResolution must be a string or number between ${\n
MIN_INTERNAL_RESOLUTION} and ${MAX_INTERNAL_RESOLUTION}, but `+\n `was
${internalResolution}`);\n return internalResolution;\n }\n}\n\nexport function
toInputResolutionHeightAndWidth(\n internalResolution: BodyPixInternalResolution,\n outputStride:
BodyPixOutputStride,\n [inputHeight, inputWidth]: [number, number]): [number, number] {\n const
internalResolutionPercentage =\n toInternalResolutionPercentage(internalResolution);\n return [\n
toValidInputResolution(\n inputHeight * internalResolutionPercentage, outputStride),\n
toValidInputResolution(\n inputWidth * internalResolutionPercentage, outputStride)\n];\n}\n\nexport function
toInputTensor(input: BodyPixInput) {\n // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n //
@ts-ignore\n return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\nexport function
resizeAndPadTo(\n imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n flipHorizontal = false):
{\n resizedAndPadded: tf.Tensor3D,\n paddedBy: [[number, number], [number, number]]\n} {\n const [height,
width] = imageTensor.shape;\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n let
resizeW: number;\n let resizeH: number;\n let padL: number;\n let padR: number;\n let padT: number;\n let
padB: number;\n if (aspect > targetAspect) {\n // resize to have the larger dimension match the shape.\n
resizeW = targetW;\n resizeH = Math.ceil(resizeW / aspect);\n const padHeight = targetH - resizeH;\n padL
= 0;\n padR = 0;\n padT = Math.floor(padHeight / 2);\n padB = targetH - (resizeH + padT);\n } else {\n
resizeH = targetH;\n resizeW = Math.ceil(targetH * aspect);\n const padWidth = targetW - resizeW;\n padL
= Math.floor(padWidth / 2);\n padR = targetW - (resizeW + padL);\n padT = 0;\n padB = 0;\n }\n const
resizedAndPadded = tf.tidy(() => {\n // resize to have largest dimension match image\n let resized:
tf.Tensor3D;\n if (flipHorizontal) {\n resized = tf.image.resizeBilinear(\n tf.reverse(imageTensor, 1),
[resizeH, resizeW]);\n } else {\n resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n }\n
const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n return padded;\n });\n return
{resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n}\n\nexport function
scaleAndCropToInputTensorShape(\n tensor: tf.Tensor3D,\n [inputTensorHeight, inputTensorWidth]: [number,
number],\n [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n [[padT, padB], [padL,
padR]]: [[number, number], [number, number]],\n applySigmoidActivation = false): tf.Tensor3D {\n return
tf.tidy(() => {\n let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n
[resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n if (applySigmoidActivation) {\n
inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n }\n return removePaddingAndResizeBack(\n

```





```

{BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation,
toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport
{decodePersonInstanceMasks, decodePersonInstancePartMasks} from
'/multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from
'/multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel,
resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput,
BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from
'/types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,
SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo,
scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D}
from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING =
false;\n\n/**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n * `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported
architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix
model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of
speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n
* stride 8,16,32 are supported for various MobileNetV1 models.\n *\n * `multiplier`: An optional number with
values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier
for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and
more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of
accuracy.\n *\n * `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for
area/countries that don't have access to the model hosted on\n * GCP.\n *\n * `quantBytes`: An optional number
with values: 1, 2, or 4. This parameter\n * affects weight quantization in the models. The available options are\n * 1
byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time,
the lower the value, the shorter the\n * loading time but lower the accuracy.\n */\nexport interface ModelConfig {\n
architecture: BodyPixArchitecture;\n outputStride: BodyPixOutputStride;\n multiplier?: BodyPixMultiplier;\n
modelUrl?: string;\n quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading
MobileNetV1 based BodyPix.\n// (And for references, the default configuration for loading ResNet\n// based
PoseNet is also included).\n// ``\n// const RESNET_CONFIG = {\n// architecture: 'ResNet50',\n//
outputStride: 32,\n// quantBytes: 4,\n// } as ModelConfig;\n// ``\n\nconst MOBILENET_V1_CONFIG = {\n
architecture: 'MobileNetV1',\n outputStride: 16,\n quantBytes: 4,\n multiplier: 0.75,\n} as ModelConfig;\n\nconst
VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];\nconst VALID_STRIDE: {[id:
string]: BodyPixOutputStride[]} = {\n 'MobileNetV1': [8, 16, 32],\n 'ResNet50': [32, 16]\n};\nconst
VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {\n 'MobileNetV1': [0.50, 0.75, 1.0],\n 'ResNet50':
[1.0]\n};\nconst VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];\n\nfunction
validateModelConfig(config: ModelConfig): ModelConfig {\n config = config || MOBILENET_V1_CONFIG;\n if (config.architecture == null) {\n config.architecture = 'MobileNetV1';\n }\n if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {\n throw new Error(\n `Invalid architecture
${config.architecture}.` +\n `Should be one of ${VALID_ARCHITECTURE}`);\n }\n if (config.outputStride
== null) {\n config.outputStride = 16;\n }\n if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {\n throw new Error(\n `Invalid
outputStride ${config.outputStride}.` +\n `Should be one of ${VALID_STRIDE[config.architecture]}` +\n
`for architecture ${config.architecture}.`);\n }\n if (config.multiplier == null) {\n config.multiplier = 1.0;\n }\n if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {\n throw new Error(\n
`Invalid multiplier ${config.multiplier}.` +\n `Should be one of
${VALID_MULTIPLIER[config.architecture]}` +\n `for architecture ${config.architecture}.`);\n }\n if (config.quantBytes == null) {\n config.quantBytes = 4;\n }\n if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {\n throw new Error(\n
`Invalid quantBytes

```

```

 ${config.quantBytes}. `+n `Should be one of ${VALID_QUANT_BYTES} `+n `for architecture
 ${config.architecture}.`);n }n return config;n}n/n/**n * BodyPix inference is configurable using the
 following config dictionary.n *n * `flipHorizontal`: If the left-right keypoint of poses/part segmentationn * should
 be flipped/mirrored horizontally. This should be set to true forn * videos where the video is by default flipped
 horizontally (i.e. a webcam),n * and you want the person & body part segmentation to be returned in the propern *
 orientation.n *n * `internalResolution`: Defaults to 'medium'. The internal resolutionn * percentage that the input
 is resized to before inference. The larger then * internalResolution the more accurate the model at the cost of
 slowern * prediction times. Available values are 'low', 'medium', 'high', 'full', or a n * percentage value between 0
 and 1. The values 'low', 'medium', 'high', andn * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.n *n *
 `segmentationThreshold`: The minimum that segmentation values mustn * have to be considered part of the person.
 Affects the generation of the n * segmentation mask. More specifically, it is the threshold used to binarizen * the
 intermediate person segmentation probability. The probability of eachn * pixel belongs to a person is in range [0,
 1]. If the probability is greatern * than the `segmentationThreshold`, it will be set to 1 otherwise 0.n *n */n
 export interface InferenceConfig {n flipHorizontal?: boolean;n internalResolution?: BodyPixInternalResolution;n
 segmentationThreshold?: number;n}n/n/**n * Person Inference Confign *n * `maxDetections`: Defaults to 10.
 Maximum number of person pose detections pern * image.n *n * `scoreThreshold`: Defaults to 0.4. Only return
 person pose that have rootn * part score greater or equal to this value.n *n * `nmsRadius`: Defaults to 20. Non-
 maximum suppression part distance in pixels.n * It needs to be strictly positive. Two pose keypoints suppress each
 other ifn * they are less than `nmsRadius` pixels away.n */n
 export interface PersonInferenceConfig extends
 InferenceConfig {n maxDetections?: number;n scoreThreshold?: number;n nmsRadius?: number;n}n/n/**n *
 Multiple Person Instance Inference Confign *n * `maxDetections`: Defaults to 10. Maximum number of returned
 instance n * segmentation and pose detections per image.n *n * `scoreThreshold`: Defaults to 0.4. Only returns and
 uses person n * poses for instance segmentation assignment when the pose has root part score n * greater or equal to
 this value.n *n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.n * It needs to be
 strictly positive. Two parts suppress each other if they are n * less than `nmsRadius` pixels away.n *n *
 `minKeypointScore`: Default to 0.3. Keypoints above the score are used n * for matching and assigning
 segmentation mask to each person.n *n * `refineSteps`: Default to 10. The number of refinement steps used when n *
 assigning the instance segmentation. It needs to be strictly positive. The n * larger the higher the accuracy and
 slower the inference.n */n
 export interface MultiPersonInstanceInferenceConfig extends InferenceConfig {n
 maxDetections?: number;n scoreThreshold?: number;n nmsRadius?: number;n minKeypointScore?: number;n
 refineSteps?: number;n}n
 export const PERSON_INFERENCE_CONFIG: PersonInferenceConfig = {n
 flipHorizontal: false,n internalResolution: 'medium',n segmentationThreshold: 0.7,n maxDetections: 10,n
 scoreThreshold: 0.4,n nmsRadius: 20,n};n
 export const
 MULTI_PERSON_INSTANCE_INFERENCE_CONFIG:n MultiPersonInstanceInferenceConfig = {n
 flipHorizontal: false,n internalResolution: 'medium',n segmentationThreshold: 0.7,n maxDetections:
 10,n scoreThreshold: 0.4,n nmsRadius: 20,n minKeypointScore: 0.3,n refineSteps: 10n
 };n
 function validatePersonInferenceConfig(config: PersonInferenceConfig) {n const {segmentationThreshold,
 maxDetections, scoreThreshold, nmsRadius} =n config;n if (segmentationThreshold < 0.0 ||
 segmentationThreshold > 1.0) {n throw new Error(n `segmentationThreshold ${segmentationThreshold}. `
 +n `Should be in range [0.0, 1.0]`);n }n if (maxDetections <= 0) {n throw new Error(n `Invalid
 maxDetections ${maxDetections}. ` +n `Should be > 0`);n }n if (scoreThreshold < 0.0 || scoreThreshold >
 1.0) {n throw new Error(n `Invalid scoreThreshold ${scoreThreshold}. ` +n `Should be in range [0.0,
 1.0]`);n }n if (nmsRadius <= 0) {n throw new Error(`Invalid nmsRadius ${nmsRadius}.`);n
 }n}n
 function validateMultiPersonInstanceInferenceConfig(n config: MultiPersonInstanceInferenceConfig) {n
 const {n segmentationThreshold,n maxDetections,n scoreThreshold,n nmsRadius,n
 minKeypointScore,n refineStepsn } = config;n if (segmentationThreshold < 0.0 || segmentationThreshold >
 1.0) {n throw new Error(n `segmentationThreshold ${segmentationThreshold}. ` +n `Should be in
 range [0.0, 1.0]`);n }n if (maxDetections <= 0) {n throw new Error(n `Invalid maxDetections

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 ${maxDetections}.` +\n `Should be > 0`);\n } \n\n if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n throw
new Error(\n `Invalid scoreThreshold ${scoreThreshold}.` +\n `Should be in range [0.0, 1.0]`);\n } \n\n if
(nmsRadius <= 0) {\n throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n } \n\n if (minKeypointScore < 0 ||
minKeypointScore > 1) {\n throw new Error(\n `Invalid minKeypointScore ${minKeypointScore}.` +\n
`Should be in range [0.0, 1.0]`);\n } \n\n if (refineSteps <= 0 || refineSteps > 20) {\n throw new Error(\n
`Invalid refineSteps ${refineSteps}.` +\n `Should be in range [1, 20]`);\n } }\n\nexport class BodyPix {\n
baseModel: BaseModel;\n\n constructor(net: BaseModel) {\n this.baseModel = net;\n } \n\n private
predictForPersonSegmentation(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n heatmapScores:
tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n }
{\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
} = this.baseModel.predict(input);\n return {\n segmentLogits: segmentation,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n } \n\n private
predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n
partHeatmapLogits: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd:
tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n } {\n const {\n segmentation,\n partHeatmaps,\n
heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } = this.baseModel.predict(input);\n
return {\n segmentLogits: segmentation,\n partHeatmapLogits: partHeatmaps,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n } \n\n private
predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n { \n segmentLogits:
tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n
displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D\n } {\n
const {\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd,\n partHeatmaps,\n } = this.baseModel.predict(input);\n return {\n segmentLogits:
segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
partHeatmaps\n };\n } \n\n /**\n * Given an image with people, returns a dictionary of all intermediate\n *
tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)
heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that
the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the
cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value
between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n
*\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered
part of the person. Affects the generation of the\n * segmentation mask.\n *\n * @return A dictionary containing
`segmentation`, `heatmapScores`, `offsets`,\n * and `padding`:\n * - `segmentation`: A 2d Tensor with 1 for the
pixels that are part of the\n * person, and 0 otherwise. The width and height correspond to the same\n *
dimensions of the input image.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * pose
estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n * estimation decoding.\n
* - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n * by pose estimation decoding.\n
* - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation
decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the
model.\n */\n segmentPersonActivation(\n input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n segmentation: tf.Tensor2D,\n
heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd:
tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n } {\n const
[height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n
const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n const {\n

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segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.predictForPersonSegmentation(resized);\n const [resizedHeight, resizedWidth]
= resized.shape;\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits,
[height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left,
padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n return {\n segmentation: toMaskTensor(\n
tf.squeeze(scaledSegmentScores), segmentationThreshold),\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n });\n resized.dispose();\n return {\n segmentation,\n
heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n
internalResolutionHeightAndWidth\n };\n }\n }/**\n * Given an image with many people, returns a
PersonSegmentation dictionary\n * that contains the segmentation mask for all people and a single pose.\n *\n *
Note: The segmentation mask returned by this method covers all people but\n * the pose works well for one
person. If you want to estimate instance-level\n * multiple person segmentation & pose for each person, use\n *
`segmentMultiPerson` instead.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the
BodyPix inference using person decoding.\n *\n * @return A SemanticPersonSegmentation dictionary that
contains height,\n * width, the flattened binary segmentation mask and the poses for all people.\n * The width and
height correspond to the same dimensions of the input image.\n * - `height`: The height of the segmentation data in
pixel unit.\n * - `width`: The width of the segmentation data in pixel unit.\n * - `data`: The flattened Uint8Array
of segmentation data. 1 means the pixel\n * belongs to a person and 0 means the pixel doesn't belong to a person.
The\n * size of the array is equal to `height` x `width` in row-major order.\n * - `allPoses`: The 2d poses of all
people.\n */\n async segmentPerson(\n input: BodyPixInput,\n config: PersonInferenceConfig =
PERSON_INFERENCE_CONFIG):\n Promise<SemanticPersonSegmentation> {\n config =
{...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n
segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n
internalResolutionHeightAndWidth\n } =\n this.segmentPersonActivation(\n input,
config.internalResolution, config.segmentationThreshold);\n const [height, width] = segmentation.shape;\n
const result = await segmentation.data() as Uint8Array;\n segmentation.dispose();\n const tensorBuffers =
await toTensorBuffers3D(\n [heatmapScores, offsets, displacementFwd, displacementBwd]);\n const
[scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n let poses =
decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses =
scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n
FLIP_POSES_AFTER_SCALING);\n heatmapScores.dispose();\n offsets.dispose();\n
displacementFwd.dispose();\n displacementBwd.dispose();\n return {height, width, data: result, allPoses:
poses};\n }\n }/**\n * Given an image with multiple people, returns an *array* of\n * PersonSegmentation
object. Each element in the array corresponding to one\n * of the people in the input image. In other words, it
predicts\n * instance-level multiple person segmentation & pose for each person.\n *\n * The model does
standard ImageNet pre-processing before inferring through\n * the model. The image pixels should have values [0-
255].\n *\n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)
The input\n * image to feed through the network.\n *\n * @param config MultiPersonInferenceConfig object
that contains\n * parameters for the BodyPix inference using multi-person decoding.\n *\n * @return An array of
PersonSegmentation object, each containing a width,\n * height, a binary array (1 for the pixels that are part of
the\n * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n * number of pixels in the
image. The width and height correspond to the\n * dimensions of the image the binary array is shaped to, which are
the same\n * dimensions of the input image.\n */\n async segmentMultiPerson(\n input: BodyPixInput,\n
config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n

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Promise<PersonSegmentation[]> {
 \n config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG,
...config};
 \n validateMultiPersonInstanceInferenceConfig(config);
 \n const [height, width] =
 getInputSize(input);
 \n const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n
 config.internalResolution, this.baseModel.outputStride, \n
 [height, width]);
 \n \n const {resized, padding} = \n
 padAndResizeTo(input, internalResolutionHeightAndWidth);
 \n const {\n segmentation, \n longOffsets, \n
 heatmapScoresRaw, \n offsetsRaw, \n displacementFwdRaw, \n displacementBwdRaw, \n
 } = tf.tidy(() =>
 {\n const {\n segmentLogits, \n longOffsets, \n heatmapScores, \n offsets, \n
 displacementFwd, \n displacementBwd, \n } =
 this.predictForMultiPersonInstanceSegmentationAndPart(resized);
 \n const scaledSegmentScores =
 scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], internalResolutionHeightAndWidth, \n
 [[padding.top, padding.bottom], [padding.left, padding.right]], \n
 APPLY_SIGMOID_ACTIVATION);
 \n const longOffsetsResized = false;
 \n let scaledLongOffsets;
 \n if (longOffsetsResized) {\n
 scaledLongOffsets = scaleAndCropToInputTensorShape(\n
 longOffsets, [height, width],
 internalResolutionHeightAndWidth, \n
 [[padding.top, padding.bottom], [padding.left, padding.right]], \n
 APPLY_SIGMOID_ACTIVATION);
 \n } else {\n scaledLongOffsets = longOffsets;
 \n }
 \n \n const
 segmentation = toMaskTensor(\n tf.squeeze(scaledSegmentScores), config.segmentationThreshold);
 \n \n return {\n segmentation, \n longOffsets: scaledLongOffsets, \n
 heatmapScoresRaw: heatmapScores, \n
 offsetsRaw: offsets, \n displacementFwdRaw: displacementFwd, \n
 displacementBwdRaw:
 displacementBwd, \n };
 \n });
 \n \n const tensorBuffers = await toTensorBuffers3D(\n
 [heatmapScoresRaw,
 offsetsRaw, displacementFwdRaw, displacementBwdRaw]);
 \n const [scoresBuf, offsetsBuf,
 displacementsFwdBuf, displacementsBwdBuf] = \n
 tensorBuffers;
 \n \n let poses = decodeMultiplePoses(\n
 scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf, \n
 this.baseModel.outputStride,
 config.maxDetections, \n config.scoreThreshold, config.nmsRadius);
 \n \n poses = scaleAndFlipPoses(\n
 poses, [height, width], internalResolutionHeightAndWidth, padding, \n
 FLIP_POSES_AFTER_SCALING);
 \n \n const instanceMasks = await decodePersonInstanceMasks(\n
 segmentation, longOffsets, poses, height, width, \n
 this.baseModel.outputStride, internalResolutionHeightAndWidth, padding, \n
 config.scoreThreshold,
 config.refineSteps, config.minKeypointScore, \n
 config.maxDetections);
 \n \n resized.dispose();
 \n segmentation.dispose();
 \n longOffsets.dispose();
 \n heatmapScoresRaw.dispose();
 \n offsetsRaw.dispose();
 \n displacementFwdRaw.dispose();
 \n displacementBwdRaw.dispose();
 \n \n return instanceMasks;
 \n }
 \n \n /**
 * Given an image with many people, returns a dictionary containing: height,
 * width, a tensor with a part id from 0-24 for the pixels that are
 * part of a corresponding body part, and -1 otherwise. This does standard
 * ImageNet pre-processing before inferring through the model. The image
 * should pixels should have values [0-255].
 *
 * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement
 * The input image to feed through the network.
 *
 * @param internalResolution Defaults to 'medium'. The internal
 * resolution
 * percentage that the input is resized to before inference. The larger the
 * internalResolution the more accurate the model at the cost of slower
 * prediction times. Available values are 'low', 'medium', 'high',
 * 'full', or
 * a percentage value between 0 and 1. The values 'low', 'medium', 'high', and
 * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.
 *
 * @param segmentationThreshold The minimum that segmentation values
 * must have
 * to be considered part of the person. Affects the clipping of the colored
 * part image.
 *
 * @return A dictionary containing `partSegmentation`, `heatmapScores`,
 * `offsets`, and `padding`:
 *
 * - `partSegmentation`: A 2d Tensor with a part id from 0-24 for
 * the pixels that are part of a corresponding body part, and -1 otherwise.
 *
 * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by
 * single-person pose estimation decoding.
 *
 * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose
 * estimation decoding.
 *
 * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement
 * used by
 * pose estimation decoding.
 *
 * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used
 * by
 * pose estimation decoding.
 *
 * - `padding`: The padding (unit pixels) being applied to the input image
 * before
 * it is fed into the model.
 *
 * @segmentPersonPartsActivation(\n input: BodyPixInput,
 internalResolution: BodyPixInternalResolution, \n
 segmentationThreshold = 0.5): {\n partSegmentation:

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tf.Tensor2D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n
displacementBwd: tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n
} {\n const [height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n
const {\n resized,\n padding,\n } = padAndResizeTo(input, internalResolutionHeightAndWidth);\n const
{\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } =
tf.tidy(() => {\n const {\n segmentLogits,\n partHeatmapLogits,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd\n } = this.predictForPersonSegmentationAndPart(resized);\n
const [resizedHeight, resizedWidth] = resized.shape;\n const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], [resizedHeight, resizedWidth],\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n
const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n partHeatmapLogits, [height, width],
[resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n const segmentation =\n
toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n return {\n partSegmentation:\n
decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n }; });\n resized.dispose();\n return {\n
partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
padding,\n internalResolutionHeightAndWidth\n }; }\n\n /**\n * Given an image with many people,
returns a PartSegmentation dictionary that\n * contains the body part segmentation mask for all people and a single
pose.\n *\n * Note: The body part segmentation mask returned by this method covers all\n * people but the pose
works well when there is one person. If you want to\n * estimate instance-level multiple person body part
segmentation & pose for\n * each person, use `segmentMultiPersonParts` instead.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the
BodyPix inference using single person decoding.\n *\n * @return A SemanticPartSegmentation dictionary that
contains height, width,\n * the flattened binary segmentation mask and the pose for the person. The\n * width and
height correspond to the same dimensions of the input image.\n * - `height`: The height of the person part
segmentation data in pixel unit.\n * - `width`: The width of the person part segmentation data in pixel unit.\n * -
`data`: The flattened Int32Array of person part segmentation data with a\n * part id from 0-24 for the pixels that are
part of a corresponding body\n * part, and -1 otherwise. The size of the array is equal to `height` x\n * `width` in
row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n async segmentPersonParts(\n input:
BodyPixInput,\n config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n
Promise<SemanticPartSegmentation> {\n config = {...PERSON_INFERENCE_CONFIG, ...config};\n
validatePersonInferenceConfig(config);\n const {\n partSegmentation,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n
this.segmentPersonPartsActivation(\n input, config.internalResolution, config.segmentationThreshold);\n
const [height, width] = partSegmentation.shape;\n const data = await partSegmentation.data() as Int32Array;\n
partSegmentation.dispose();\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScores, offsets,
displacementFwd, displacementBwd]);\n const [scoresBuf, offsetsBuf, displacementsFwdBuf,
displacementsBwdBuf] =\n tensorBuffers;\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n
config.scoreThreshold, config.nmsRadius);\n poses = scaleAndFlipPoses(\n poses, [height, width],
internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n
heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n
return {height, width, data, allPoses: poses}; }\n\n /**\n * Given an image with multiple people, returns an
array of PartSegmentation\n * object. Each element in the array corresponding to one\n * of the people in the
input image. In other words, it predicts\n * instance-level multiple person body part segmentation & pose for

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each\n * person.\n *\n * This does standard ImageNet pre-processing before inferring through\n * the model.
The image pixels should have values [0-255].\n *\n * @param input\n *
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n * image to feed
through the network.\n *\n * @param config MultiPersonInferenceConfig object that contains\n * parameters for
the BodyPix inference using multi-person decoding.\n *\n * @return An array of PartSegmentation object, each
containing a width,\n * height, a flattened array (with part id from 0-24 for the pixels that are\n * part of a
corresponding body part, and -1 otherwise) and 2D pose. The width\n * and height correspond to the dimensions of
the image. Each flattened part\n * segmentation array size is equal to `height` x `width`.\n */\n async
segmentMultiPersonParts(\n input: BodyPixInput,\n config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n config =
{...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n\n
validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] = getInputSize(input);\n const
internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n config.internalResolution,
this.baseModel.outputStride,\n [height, width]);\n const {resized, padding} =\n padAndResizeTo(input,
internalResolutionHeightAndWidth);\n const {\n segmentation,\n longOffsets,\n heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n partSegmentation,\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n
displacementFwd,\n displacementBwd,\n partHeatmaps\n } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n // decoding with scaling.\n const
scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits, [height, width],
internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n
APPLY_SIGMOID_ACTIVATION);\n\n // decoding with scaling.\n const scaledPartSegmentationScores =
scaleAndCropToInputTensorShape(\n partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n
[[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n\n
const scaledLongOffsets = longOffsets;\n const segmentation = toMaskTensor(\n
tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n const partSegmentation =\n
decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n return {\n segmentation,\n longOffsets:
scaledLongOffsets,\n heatmapScoresRaw: heatmapScores,\n offsetsRaw: offsets,\n
displacementFwdRaw: displacementFwd,\n displacementBwdRaw: displacementBwd,\n
partSegmentation\n };\n });\n\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScoresRaw,
offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n const [scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n\n let poses = decodeMultiplePoses(\n
scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride,
config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n poses = scaleAndFlipPoses(\n
poses, [height, width], internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n\n
const instanceMasks = await decodePersonInstancePartMasks(\n segmentation, longOffsets, partSegmentation,
poses, height, width,\n this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n
config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n config.maxDetections);\n\n
resized.dispose();\n segmentation.dispose();\n longOffsets.dispose();\n heatmapScoresRaw.dispose();\n
offsetsRaw.dispose();\n displacementFwdRaw.dispose();\n displacementBwdRaw.dispose();\n
partSegmentation.dispose();\n\n return instanceMasks;\n }\n\n public dispose() {\n this.baseModel.dispose();\n
}\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\n\n async function loadMobileNet(config: ModelConfig):
Promise<BodyPix> {\n const outputStride = config.outputStride;\n const quantBytes = config.quantBytes;\n const
multiplier = config.multiplier;\n if (tf == null) {\n throw new Error(\n `Cannot find TensorFlow.js. If you are
using a <script> tag, please ` +\n `also include @tensorflow/tfjs on the page before using this\n model.`);\n
}\n\n const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);\n const mobilenet = new MobileNet(graphModel, outputStride);\n
return new BodyPix(mobilenet);\n }\n\n\n/**\n * Loads the ResNet BodyPix model.\n */\n\n async function

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```
loadResNet(config: ModelConfig): Promise<BodyPix> {
 const outputStride = config.outputStride;
 const quantBytes = config.quantBytes;
 if (tf == null) {
 throw new Error(`Cannot find TensorFlow.js. If you
are using a <script> tag, please ` +
 `also include @tensorflow/tfjs on the page before using this
model.`);
 }
 const url = resNet50SavedModel(outputStride, quantBytes);
 const graphModel = await
tfconv.loadGraphModel(config.modelUrl || url);
 const resnet = new ResNet(graphModel, outputStride);
 return
new BodyPix(resnet);
}
/**
 * Loads the BodyPix model instance from a checkpoint, with the ResNet
 * or MobileNet architecture. The model to be loaded is configurable using the
 * config dictionary ModelConfig. Please find more details in the
 * documentation of the ModelConfig.
 * @param config ModelConfig dictionary that contains parameters for
 * the BodyPix loading process. Please find more details of each parameters
 * in the documentation of the ModelConfig interface. The predefined
 * `MOBILENET_V1_CONFIG` and `RESNET_CONFIG` can also be used as references
 * for defining your customized config.
 */
export async function load(config: ModelConfig = MOBILENET_V1_CONFIG):
 Promise<BodyPix> {
 config = validateModelConfig(config);
 if (config.architecture === 'ResNet50') {
 return loadResNet(config);
 } else if
(config.architecture === 'MobileNetV1') {
 return loadMobileNet(config);
 } else {
 return null;
 }
}
"/**
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 * you may not use this file except in compliance with the License.
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 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
```

```
=====
/*
 * method copied from bGlur in https://codepen.io/zhaojun/pen/zZmRQe
 */
export function cpuBlur(
 canvas: HTMLCanvasElement|OffscreenCanvas,
 image:
 HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,
 blur: number) {
 const ctx = canvas.getContext('2d');
 let sum = 0;
 const delta = 5;
 const alphaLeft = 1 / (2 * Math.PI * delta *
 delta);
 const step = blur < 3 ? 1 : 2;
 for (let y = -blur; y <= blur; y += step) {
 for (let x = -blur; x <= blur; x
 += step) {
 const weight =
 alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));
 sum +=
 weight;
 }
 }
 for (let y = -blur; y <= blur; y += step) {
 for (let x = -blur; x <= blur; x +=
 step) {
 ctx.globalAlpha = alphaLeft *
 Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;
 ctx.drawImage(image, x, y);
 }
 }
 ctx.globalAlpha = 1;
}
"/**
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 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
```

```
=====
/*
 */
import {cpuBlur} from './blur';
import {Color, PartSegmentation, PersonSegmentation} from
 './types';
import {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';
import {getInputSize} from './util';
export type Canvas = HTMLCanvasElement | OffscreenCanvas;
export type ImageType = HTMLImageElement|HTMLVideoElement|Canvas;
type HasDimensions = {
 width: number,
 height: number
};
function isSafari() {
 return
 (/^(?!chrome|android).*safari/i.test(navigator.userAgent));
}
function assertSameDimensions(
 {width: widthA, height: heightA}: HasDimensions,
 {width: widthB, height: heightB}: HasDimensions,
 nameA: string,
 nameB: string) {
 if (widthA !== widthB || heightA !== heightB) {
 throw new Error(`error: dimensions must
match. ${nameA} has dimensions ${
widthA}x${heightA}, ${nameB} has dimensions
${widthB}x${heightB}`);
 }
}
function flipCanvasHorizontal(canvas: Canvas) {
 const ctx =
 canvas.getContext('2d');
 ctx.scale(-1, 1);
 ctx.translate(-canvas.width, 0);
}
function
```



```

drawWithCompositing(\n ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D,\n image:
Canvas|ImageType,\n compositeOperation: string) {\n ctx.globalCompositeOperation = compositeOperation;\n
ctx.drawImage(image, 0, 0);\n}\n\nfunction createOffScreenCanvas(): Canvas {\n if (typeof document !==
'undefined') {\n return document.createElement('canvas');\n } else if (typeof OffscreenCanvas !== 'undefined')
{\n return new OffscreenCanvas(0, 0);\n } else {\n throw new Error('Cannot create a canvas in this context');\n
}\n}\n\nfunction ensureOffscreenCanvasCreated(id: string): Canvas {\n if (!offScreenCanvases[id]) {\n
offScreenCanvases[id] = createOffScreenCanvas();\n }\n return offScreenCanvases[id];\n}\n\nfunction
drawAndBlurImageOnCanvas(\n image: ImageType, blurAmount: number, canvas: Canvas) {\n const {height,
width} = image;\n const ctx = canvas.getContext('2d');\n canvas.width = width;\n canvas.height = height;\n
ctx.clearRect(0, 0, width, height);\n ctx.save();\n if (isSafari()) {\n cpuBlur(canvas, image, blurAmount);\n } else
{\n // tslint:disable:no-any\n (ctx as any).filter = `blur(${blurAmount}px)`;\n ctx.drawImage(image, 0, 0,
width, height);\n }\n ctx.restore();\n}\n\nfunction drawAndBlurImageOnOffScreenCanvas(\n image: ImageType,
blurAmount: number,\n offscreenCanvasName: string): Canvas {\n const canvas =
ensureOffscreenCanvasCreated(offscreenCanvasName);\n if (blurAmount === 0) {\n
renderImageToCanvas(image, canvas);\n } else {\n drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n
}\n return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n const {width,
height} = image;\n canvas.width = width;\n canvas.height = height;\n const ctx = canvas.getContext('2d');\n
ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction
renderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n canvas.width = image.width;\n canvas.height
= image.height;\n const ctx = canvas.getContext('2d');\n ctx.putImageData(image, 0, 0);\n}\n\nfunction
renderImageDataToOffScreenCanvas(\n image: ImageData, canvasName: string): Canvas {\n const canvas =
ensureOffscreenCanvasCreated(canvasName);\n renderImageDataToCanvas(image, canvas);\n return
canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with
foreground and background color at each pixel determined by the\n * corresponding binary segmentation value at
the pixel from the output. In\n * other words, pixels where there is a person will be colored with foreground\n *
color and where there is not a person will be colored with background color.\n */\n * @param
personOrPartSegmentation The output from\n * `segmentPerson`, `segmentMultiPerson`,\n * `segmentPersonParts`
or `segmentMultiPersonParts`. They can\n * be SemanticPersonSegmentation object, an array of
PersonSegmentation object,\n * SemanticPartSegmentation object, or an array of PartSegmentation object.\n */\n *
@param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color\n * (r,g,b,a) for visualizing pixels that
belong to people.\n */\n * @param background Default to {r:0, g:0, b:0, a: 255}. The background color\n * (r,g,b,a)
for visualizing pixels that don't belong to people.\n */\n * @param drawContour Default to false. Whether to draw
the contour around each\n * person's segmentation mask or body part mask.\n */\n * @param foregroundIds Default
to [1]. The integer values that represent\n * foreground. For person segmentation, 1 is the foreground. For body
part\n * segmentation, it can be a subset of all body parts ids.\n */\n * @returns An ImageData with the same width
and height of\n * all the PersonSegmentation in multiPersonSegmentation, with opacity and\n * transparency at each
pixel determined by the corresponding binary\n * segmentation value at the pixel from the output.\n */\n\nexport
function toMask(\n personOrPartSegmentation: SemanticPersonSegmentation|\n
SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n foreground: Color = {\n r: 0,\n g:
0,\n b: 0,\n a: 0\n },\n background: Color = {\n r: 0,\n g: 0,\n b: 0,\n a: 255\n },\n
drawContour = false, foregroundIds: number[] = [1]): ImageData {\n if (Array.isArray(personOrPartSegmentation)
&&\n personOrPartSegmentation.length === 0) {\n return null;\n }\n let multiPersonOrPartSegmentation:\n
Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n
PersonSegmentation|PartSegmentation>;\n if (!Array.isArray(personOrPartSegmentation)) {\n
multiPersonOrPartSegmentation = [personOrPartSegmentation];\n } else {\n multiPersonOrPartSegmentation =
personOrPartSegmentation;\n }\n const {width, height} = multiPersonOrPartSegmentation[0];\n const bytes =
new Uint8ClampedArray(width * height * 4);\n function drawStroke(\n bytes: Uint8ClampedArray, row:
number, column: number, width: number,\n radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n

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for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++) {\n if (i !== 0 && j !== 0) {\n const n = (row + i) * width + (column + j);\n bytes[4 * n + 0] = color.r;\n bytes[4 * n + 1] = color.g;\n bytes[4 * n + 2] = color.b;\n bytes[4 * n + 3] = color.a;\n }\n }\n}\n\nfunction\nisSegmentationBoundary(\n segmentationData: Uint8Array|Int32Array,\n row: number,\n column:\n number,\n width: number,\n foregroundIds: number[] = [1],\n radius = 1,\n): boolean {\n let\n numberBackgroundPixels = 0;\n for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++)\n {\n if (i !== 0 && j !== 0) {\n const n = (row + i) * width + (column + j);\n if\n (!foregroundIds.some(id => id === segmentationData[n])) {\n numberBackgroundPixels += 1;\n }\n }\n }\n }\n return numberBackgroundPixels > 0;\n}\n\nfor (let i = 0; i < height; i += 1) {\n for (let j = 0; j\n < width; j += 1) {\n const n = i * width + j;\n bytes[4 * n + 0] = background.r;\n bytes[4 * n + 1] =\n background.g;\n bytes[4 * n + 2] = background.b;\n bytes[4 * n + 3] = background.a;\n for (let k = 0; k <\n multiPersonOrPartSegmentation.length; k++) {\n if (foregroundIds.some(\n id => id ===\n multiPersonOrPartSegmentation[k].data[n])) {\n bytes[4 * n] = foreground.r;\n bytes[4 * n + 1] =\n foreground.g;\n bytes[4 * n + 2] = foreground.b;\n bytes[4 * n + 3] = foreground.a;\n const\n isBoundary = isSegmentationBoundary(\n multiPersonOrPartSegmentation[k].data, i, j, width,\n foregroundIds);\n if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 &&\n j + 1 < width\n && isBoundary) {\n drawStroke(bytes, i, j, width, 1);\n }\n }\n }\n }\n}\n\nreturn new\nImageData(bytes, width, height);\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> =\n[\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99],\n [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87],\n [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65,\n 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\n*\n * Given the output from person body part segmentation (or\n * multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image\n * with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param\n * partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a\n * SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param partColors A\n * multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n * @returns An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation,\n * with the corresponding color for each part at\n * each pixel, and black pixels where there is no part.\n */\n\nexport\nfunction toColoredPartMask(\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n partColors:\n Array<[number, number, number]> =\n RAINBOW_PART_COLORS): ImageData {\n if\n (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n return null;\n }\n\n let\n multiPersonPartSegmentation;\n if (!Array.isArray(partSegmentation)) {\n multiPersonPartSegmentation =\n [partSegmentation];\n } else {\n multiPersonPartSegmentation = partSegmentation;\n }\n\n const {width, height}\n = multiPersonPartSegmentation[0];\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0;\n i < height * width; ++i) {\n // invert mask. Invert the segmentation mask.\n const j = i * 4;\n bytes[j + 0] =\n 255;\n bytes[j + 1] = 255;\n bytes[j + 2] = 255;\n bytes[j + 3] = 255;\n for (let k = 0; k <\n multiPersonPartSegmentation.length; k++) {\n const partId = multiPersonPartSegmentation[k].data[i];\n if\n (partId !== -1) {\n const color = partColors[partId];\n if (!color) {\n throw new Error(`No color could\n be found for part id ${partId}`);\n }\n bytes[j + 0] = color[0];\n bytes[j + 1] = color[1];\n bytes[j +\n 2] = color[2];\n bytes[j + 3] = 255;\n }\n }\n }\n\n return new ImageData(bytes, width, height);\n}\n\nconst\nCANVAS_NAMES = {\n blurred: 'blurred',\n blurredMask: 'blurred-mask',\n mask: 'mask',\n lowresPartMask:\n 'lowres-part-mask'\n};\n\n*\n * Given an image and a maskImage of type ImageData, draws the image with the\n *\n * mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The\n * original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this\n * should be\n * generated by toMask or toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask\n * when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param\n * maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n
```

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*\n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n */\nexport function
drawMask(\n canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n maskOpacity = 0.7,\n maskBlurAmount = 0, flipHorizontal = false) {\n const [height, width] = getInputSize(image);\n canvas.width =
width;\n canvas.height = height;\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n
flipCanvasHorizontal(canvas);\n }\n ctx.drawImage(image, 0, 0);\n ctx.globalAlpha = maskOpacity;\n if
(maskImage) {\n assertSameDimensions({ width, height }, maskImage, 'image', 'mask');\n const mask =
renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n const blurredMask =
drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n ctx.drawImage(blurredMask, 0, 0, width, height);\n }\n ctx.restore();\n}\n\n/**\n * Given an image and a
maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n */\n
@param canvas The canvas to be drawn onto.\n */\n * @param image The original image to apply the mask to.\n */\n
* @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by
toColoredPartMask.\n */\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n *
image. Defaults to 0.7. Should be a float between 0 and 1.\n */\n * @param maskBlurAmount How many pixels to
blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n */\n * @param flipHorizontal If the
result should be flipped horizontally. Defaults\n * to false.\n */\n * @param pixelCellWidth The width of each pixel
cell. Default to 10 px.\n */\nexport function drawPixelatedMask(\n canvas: Canvas, image: ImageType,\n maskImage: ImageData,\n maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n pixelCellWidth =
10.0) {\n const [height, width] = getInputSize(image);\n assertSameDimensions({ width, height }, maskImage,
'image', 'mask');\n const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n const
blurredMask = drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount,\n CANVAS_NAMES.blurredMask);\n canvas.width = blurredMask.width;\n canvas.height =
blurredMask.height;\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n
flipCanvasHorizontal(canvas);\n }\n const offscreenCanvas =\n ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n const offscreenCanvasCtx =
offscreenCanvas.getContext('2d');\n offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n
offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n offscreenCanvasCtx.drawImage(\n
blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,\n offscreenCanvas.width,\n offscreenCanvas.height);\n ctx.imageSmoothingEnabled = false;\n ctx.drawImage(\n offscreenCanvas, 0, 0,\n offscreenCanvas.width, offscreenCanvas.height, 0,\n 0, canvas.width, canvas.height);\n // Draws vertical grid
lines that are `pixelCellWidth` apart from each other.\n for (let i = 0; i < offscreenCanvas.width; i++) {\n
ctx.beginPath();\n ctx.strokeStyle = '#ffffff';\n ctx.moveTo(pixelCellWidth * i, 0);\n ctx.lineTo(pixelCellWidth
* i, canvas.height);\n ctx.stroke();\n }\n // Draws horizontal grid lines that are `pixelCellWidth` apart from
each\n // other.\n for (let i = 0; i < offscreenCanvas.height; i++) {\n ctx.beginPath();\n ctx.strokeStyle =
'#ffffff';\n ctx.moveTo(0, pixelCellWidth * i);\n ctx.lineTo(canvas.width, pixelCellWidth * i);\n ctx.stroke();\n
}\n ctx.globalAlpha = 1.0 - maskOpacity;\n ctx.drawImage(image, 0, 0, blurredMask.width,\n blurredMask.height);\n ctx.restore();\n}\n\nfunction createPersonMask(\n multiPersonSegmentation:
PersonSegmentation[]|SemanticPersonSegmentation,\n edgeBlurAmount: number): Canvas {\n const
backgroundMaskImage = toMask(\n multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},\n {r: 0, g: 0, b: 0, a:
0});\n const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,\n CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,\n CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n */\n * @param canvas The canvas to draw the background-blurred
image onto.\n */\n * @param image The image to blur the background of and draw.\n */\n * @param
personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n */\n * @param
backgroundBlurAmount How many pixels in the background blend into each\n * other. Defaults to 3. Should be an
integer between 1 and 20.\n */\n * @param edgeBlurAmount How many pixels to blur on the edge between the

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person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param
flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n *\nexport function
drawBokehEffect(\n canvas: Canvas, image: ImageType,\n multiPersonSegmentation:
SemanticPersonSegmentation|PersonSegmentation[],\n backgroundBlurAmount = 3, edgeBlurAmount = 3,
flipHorizontal = false) {\n const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n image,
backgroundBlurAmount, CANVAS_NAMES.blurred);\n canvas.width = blurredImage.width;\n canvas.height =
blurredImage.height;\n\n const ctx = canvas.getContext('2d');\n\n if (Array.isArray(multiPersonSegmentation)
&&\n multiPersonSegmentation.length === 0) {\n ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if
(flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const
[height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The
existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else
is made\n // transparent.\"\n // crop what's not the person using the mask from the original image\n
drawWithCompositing(ctx, personMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is
kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // draw the blurred background on top of the original image where it doesn't\n // overlap.\n
drawWithCompositing(ctx, blurredImage, 'destination-over');\n ctx.restore();\n}\n\nfunction
createBodyPartMask(\n multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n
bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n const backgroundMaskImage = toMask(\n
multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n\n
const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred
image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param
partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation object.\n *\n * @param
bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be
one of the 24 body part ids.\n *\n * @param backgroundBlurAmount How many pixels in the background blend into
each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n *\n * @param edgeBlurAmount How many
pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer
between 0 and 20.\n *\n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to
false.\n *\nexport function blurBodyPart(\n canvas: Canvas, image: ImageType,\n partSegmentation:
SemanticPartSegmentation|PartSegmentation[],\n bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
edgeBlurAmount = 3,\n flipHorizontal = false) {\n const blurredImage =
drawAndBlurImageOnOffScreenCanvas(\n image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n\n canvas.width = blurredImage.width;\n canvas.height = blurredImage.height;\n\n const ctx =
canvas.getContext('2d');\n\n if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n
ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const bodyPartMask =\n createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);\n\n ctx.save();\n if (flipHorizontal)
{\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const [height, width] =
getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The existing canvas
content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\"\n // crop what's not the person using the mask from the original image\n drawWithCompositing(ctx,
bodyPartMask, 'destination-in');\n // \"destination-over\" - \"The existing canvas content is kept where both the\n //
new shape and existing canvas content overlap. Everything else is made\n // transparent.\"\n // draw the blurred
background on top of the original image where it doesn't\n // overlap.\n drawWithCompositing(ctx, blurredImage,
'destination-over');\n ctx.restore();\n}\n\n\", \"**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n

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*\n\nexport const PART_CHANNELS: string[] = [\n 'left_face',\n 'right_face',\n 'left_upper_arm_front',\n 'left_upper_arm_back',\n 'right_upper_arm_front',\n 'right_upper_arm_back',\n 'left_lower_arm_front',\n 'left_lower_arm_back',\n 'right_lower_arm_front',\n 'right_lower_arm_back',\n 'left_hand',\n 'right_hand',\n 'torso_front',\n 'torso_back',\n 'left_upper_leg_front',\n 'left_upper_leg_back',\n 'right_upper_leg_front',\n 'right_upper_leg_back',\n 'left_lower_leg_front',\n 'left_lower_leg_back',\n 'right_lower_leg_front',\n 'right_lower_leg_back',\n 'left_feet',\n 'right_feet'];\n\n/** @license See the LICENSE file. *\n\n// This code is auto-generated, do not modify this file!\nconst version = '2.2.0';\nexport {version};\n\n], "names": ["toFlattenedOneHotPartMap", "partHeatmapScores", "numParts", "shape", "partMapLocation", "s", "tf.argmax", "partMapFlattened", "tf.reshape", "tf.oneHot", "clipByMask2d", "image", "mask", "tf.mul", "toMaskTensor", "segmentScores", "threshold", "tf.tidy", "tf.cast", "tf.greater", "tf.scalar", "decodePartSegmentation", "segmentationMask", "_a", "partMapHeight", "partMapWidth", "flattenedMap", "partNumbers", "tf.expandDims", "tf.range", "tf.matmul", "partMap", "partMapShiftedUpForClipping", "tf.add", "tf.sub", "decodeOnlyPartSegmentation", "model", "outputStride", "this", "inputShape", "inputs", "tf.util", "assert", "BaseModel", "input", "asFloat", "_this", "preprocessInput", "asBatch", "results3d", "predict", "map", "y", "tf.squeeze", "namedResults", "nameOutputResults", "heatmapScores", "tf.sigmoid", "heatmap", "offsets", "displacementFwd", "displacementBwd", "segmentation", "partHeatmaps", "longOffsets", "partOffsets", "dispose", "__extends", "MobileNet", "tf.div", "results", "PART_NAMES", "NUM_KEYPOINTS", "length", "PART_IDS", "reduce", "result", "jointName", "i", "CONNECTED_PART_NAMES", "POSE_CHAIN", "CONNECTED_PART_INDICES", "jointNameA", "jointNameB", "getScale", "_b", "padding", "height", "width", "inputResolutionY", "inputResolutionX", "padT", "padB", "getOffsetPoint", "x", "keypoint", "get", "getImageCoords", "part", "heatmapX", "heatmapY", "clamp", "a", "min", "max", "squaredDistance", "y1", "x1", "y2", "x2", "dy", "dx", "addVectors", "b", "computeDistance", "embedding", "pose", "minPartScore", "distance", "numKpt", "p", "keypoints", "score", "Math", "position", "Infinity", "convertToPositionInOutput", "stride", "padL", "scaleX", "scaleY", "round", "getEmbedding", "location", "keypointIndex", "convertToPosition", "outputResolutionX", "refineSteps", "newLocation", "nn", "t", "newPos", "nn_1", "matchEmbeddingToInstance", "poses", "numKptForMatching", "_c", "embed", "pair", "keypointsIndex", "push", "kMin", "kMinDist", "k", "dist", "getOutputResolution", "decodeMultipleMasksCPU", "posesAboveScore", "inHeight", "inWidth", "dataArrays", "Uint8Array", "fill", "j", "n", "decodeMultiplePartMasksCPU", "partSegmentaion", "Int32Array", "decodeMultipleMasksWebGl", "minKptScore", "maxNumPeople", "origHeight", "origWidth", "slice", "outHeight", "outWidth", "shapedLongOffsets", "poseVals", "Float32Array", "poseOffset", "kp", "offset", "_d", "posesTensor", "tf.tensor", "program", "variableNames", "outputShape", "userCode", "tf.backend", "compileAndRun", "toPersonKSegmentation", "tf.equal", "toPersonKPartSegmentation", "bodyParts", "isWebGlBackend", "getBackend", "decodePersonInstanceMasks", "minPoseScore", "minKeypointScore", "filter", "personSegmentations", "masksTensorInfo", "masksTensor", "tf.engine", "makeTensorFromDataId", "dataId", "dtype", "_", "Promise", "all", "data", "personSegmentationsData", "forEach", "segmentationsData", "longOffsetsData", "decodePersonInstancePartMasks", "partSegmentation", "partSegmentations", "partSegmentationsByPersonData", "partSegmentaionData", "half", "floor", "maxSize", "getElementValue", "priorityQueue", "Array", "numberOfElements", "MaxHeap", "swim", "exchange", "sink", "less", "getValueAt", "scoreIsMaximumInLocalWindow", "keypointId", "localMaximumRadius", "scores", "localMaximum", "yStart", "yEnd", "yCurrent", "xStart", "xEnd", "xCurrent", "buildPartWithScoreQueue", "scoreThreshold", "numKeypoints", "queue", "enqueue", "id", "parentChildrenTuples", "parentJoinName", "childJoinName", "parentToChildEdges", "childToParentEdges", "getDisplacement", "edgeId", "point", "displacements", "numEdges", "getStridedIndexNearPoint", "traverseToTargetKeypoint", "sourceKeypoint", "targetKeypointId", "scoresBuffer", "offsetRefineStep", "displacement", "targetKeypoint", "targetKeypointIndices", "offsetPoint", "targetKeypointIndices", "decodePose", "root", "displacementsFwd", "displacementsBwd", "instanceKeypoints", "root
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}

Found in path(s):

```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/body-pix.esm.js.map
```

No license file was found, but licenses were detected in source scan.

```
{"version":3,"file":"body-pix.js","sources":["../src/decode_part_map.ts","../src/base_model.ts","../src/mobilenet.ts","../src/keypoints.ts","../src/multi_person/util.ts","../src/multi_person/decode_multiple_masks_cpu.ts","../src/multi_person/decode_multiple_masks_webgl.ts","../src/multi_person/decode_instance_masks.ts","../src/multi_person/max_heap.ts","../src/multi_person/build_part_with_score_queue.ts","../src/multi_person/decode_pose.ts","../src/multi_person/decode_multiple_poses.ts","../src/resnet.ts","../src/saved_models.ts","../src/util.ts","../src/body_pix_model.ts","../src/blur.ts","../src/output_rendering_util.ts","../src/part_channels.ts","../src/version.ts","../src/index.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
=====\n * \n * import * as tf from '@tensorflow/tfjs-core';\n * Takes the sigmoid of the part heatmap output and\n * generates a 2d one-hot\n * tensor with ones where the part's score has the maximum value.\n * @param\n * partHeatmapScores\n * function toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n * const numParts = partHeatmapScores.shape[2];\n * const partMapLocations = tf.argmax(partHeatmapScores, 2);\n * const partMapFlattened = tf.reshape(partMapLocations, [-1]);\n * return tf.oneHot(partMapFlattened, numParts) as\n * tf.Tensor2D;\n * }\n * function clipByMask2d(image: tf.Tensor2D, mask: tf.Tensor2D): tf.Tensor2D {\n * return\n * tf.mul(image, mask);\n * }\n * Takes the sigmoid of the segmentation output, and generates a segmentation\n * mask with a 1 or 0 at each pixel where there is a person or not a person. The\n * segmentation threshold determines\n * the threshold of a score for a pixel for it\n * to be considered part of a person.\n * @param segmentScores A 3d-\n * tensor of the sigmoid of the segmentation output.\n * @param segmentationThreshold The minimum that\n * segmentation values must have\n * to be considered part of the person. Affects the generation of the\n * segmentation mask and the clipping of the colored part image.\n * @returns A segmentation mask with a 1 or 0\n * at each pixel where there is a\n * person or not a person.\n * export function toMaskTensor(\n * segmentScores:\n * tf.Tensor2D, threshold: number): tf.Tensor2D {\n * return tf.tidy(\n * () =>\n * (tf.cast(tf.greater(\n * segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));\n * }\n * Takes the sigmoid of the person and\n * part map output, and returns a 2d tensor\n * of an image with the corresponding value at each pixel corresponding to\n * the\n * part with the highest value. These part ids are clipped by the segmentation\n * mask. Wherever the a pixel is
```



clipped by the segmentation mask, its value will set to -1, indicating that there is no part in that pixel.

@param segmentScores A 3d-tensor of the sigmoid of the segmentation output.

@param partHeatmapScores A 3d-tensor of the sigmoid of the part heatmap output. The third dimension corresponds to the part.

@returns A 2d tensor of an image with the corresponding value at each pixel corresponding to the part with the highest value. These part ids are clipped by the segmentation mask. It will have values of -1 for pixels that are outside of the body and do not have a corresponding part.

```

export function decodePartSegmentation(
 segmentationMask: tf.Tensor2D,
 partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
 const [partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;
 return tf.tidy(() => {
 const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);
 const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);
 const partMapFlattened = tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');
 const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);
 const partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));
 return tf.sub(clipByMask2d(partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask), tf.scalar(1, 'int32'));
 });
}

export function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {
 const [partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;
 return tf.tidy(() => {
 const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);
 const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);
 const partMapFlattened = tf.cast(tf.matmul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');
 return tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);
 });
}

```

=====  
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```

import * as tfconv from '@tensorflow/tfjs-converter';
import * as tf from '@tensorflow/tfjs-core';
import {BodyPixOutputStride} from './types';

/**
 * BodyPix supports using various convolution neural network models
 * (e.g. ResNet and MobileNetV1) as its underlying base model. The following BaseModel interface
 * defines a unified interface for creating such BodyPix base models. Currently both MobileNet (in
 * ./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel interface. New base models that conform
 * to the BaseModel interface can be added to BodyPix.
 */
export abstract class BaseModel {
 constructor(protected readonly model: tfconv.GraphModel, public readonly outputStride: BodyPixOutputStride) {
 const inputShape = this.model.inputs[0].shape as [number, number, number, number];
 tf.util.assert((inputShape[1] === -1) && (inputShape[2] === -1), () => `Input shape [${inputShape[1]}, ${inputShape[2]}]`
 + ` must both be equal to or -1`);
 }
 abstract preprocessInput(input: tf.Tensor3D): tf.Tensor3D;

 /**
 * Predicts intermediate Tensor representations.
 * @param input The input RGB image of the base model.
 * A Tensor of shape: [inputResolution, inputResolution, 3].
 * @return A dictionary of base model's intermediate predictions.
 * The returned dictionary should contains the following elements:
 * - heatmapScores: A Tensor3D that represents the keypoint heatmap scores.
 * - offsets: A Tensor3D that represents the offsets.
 * - displacementFwd: A Tensor3D that represents the forward displacement.
 * - displacementBwd: A Tensor3D that represents the backward displacement.
 * - segmentation: A Tensor3D that represents the segmentation of all people.
 * - longOffsets: A Tensor3D that represents the long offsets used for instance grouping.
 * - partHeatmaps: A Tensor3D that represents the body part segmentation.
 */
 predict(input: tf.Tensor3D): {
 heatmapScores: tf.Tensor3D,
 offsets: tf.Tensor3D,
 displacementFwd: tf.Tensor3D,
 displacementBwd: tf.Tensor3D,
 segmentation: tf.Tensor3D,
 partHeatmaps: tf.Tensor3D,
 longOffsets: tf.Tensor3D,
 partOffsets: tf.Tensor3D
 } {
 return tf.tidy(() => {
 const asFloat = this.preprocessInput(tf.cast(input, 'float32'));
 const asBatch = tf.expandDims(asFloat, 0);
 const results =

```

```

this.model.predict(asBatch) as tf.Tensor4D[];\n const results3d: tf.Tensor3D[] = results.map(y => tf.squeeze(y,
[0]));\n const namedResults = this.nameOutputResults(results3d);\n\n return {\n heatmapScores:
tf.sigmoid(namedResults.heatmap),\n offsets: namedResults.offsets,\n displacementFwd:
namedResults.displacementFwd,\n displacementBwd: namedResults.displacementBwd,\n segmentation:
namedResults.segmentation,\n partHeatmaps: namedResults.partHeatmaps,\n longOffsets:
namedResults.longOffsets,\n partOffsets: namedResults.partOffsets\n };\n };\n }\n\n // Because
MobileNet and ResNet predict() methods output a different order for\n // these values, we have a method that needs
to be implemented to order them.\n abstract nameOutputResults(results: tf.Tensor3D[]): {\n heatmap:
tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n partOffsets:
tf.Tensor3D\n };\n\n /**\n * Releases the CPU and GPU memory allocated by the model.\n */\n dispose() {\n
this.model.dispose();\n }\n }\n\n", "/*\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n *
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*/\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport { BaseModel } from './base_model';\n\nexport class
MobileNet extends BaseModel {\n preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n // Normalize the pixels
[0, 255] to be between [-1, 1].\n return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n }\n\n nameOutputResults(results: tf.Tensor3D[]) {\n const [\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets,\n] = results;\n return {\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets\n };\n }\n }\n\n", "/*\n * @license\n * Copyright 2019
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\n\n
=====\n
*/\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple =
Tuple<number>;\n\nexport const PART_NAMES = [\n 'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar',
'leftShoulder',\n 'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n 'leftHip', 'rightHip', 'leftKnee',
'rightKnee', 'leftAnkle', 'rightAnkle'\n];\n\nexport const NUM_KEYPOINTS = PART_NAMES.length;\n\nexport
interface NumberDict {\n [jointName: string]: number;\n }\n\nexport const PART_IDS =\nPART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n result[jointName] = i;\n return result;\n }, {});\n\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n ['leftHip', 'leftShoulder'],
['leftElbow', 'leftShoulder'],\n ['leftElbow', 'leftWrist'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['rightHip',
'rightShoulder'],\n ['rightElbow', 'rightShoulder'], ['rightElbow', 'rightWrist'],\n ['rightHip', 'rightKnee'],
['rightKnee', 'rightAnkle'],\n ['leftShoulder', 'rightShoulder'], ['leftHip', 'rightHip']\n];\n\n*/\n\n * Define the skeleton.
This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree,
however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the
tree root as any node.\n\n*/\n\nexport const POSE_CHAIN: StringTuple[] = [\n ['nose', 'leftEye'], ['leftEye', 'leftEar'],
['nose', 'rightEye'],\n ['rightEye', 'rightEar'], ['nose', 'leftShoulder'],\n ['leftShoulder', 'leftElbow'], ['leftElbow',
'leftWrist'],\n ['leftShoulder', 'leftHip'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['nose', 'rightShoulder'],\n

```

```

['rightShoulder', 'rightElbow'], ['rightElbow', 'rightWrist'],\n ['rightShoulder', 'rightHip'], ['rightHip', 'rightKnee'],\n
['rightKnee', 'rightAnkle']\n);\n\nexport const CONNECTED_PART_INDICES =
CONNECTED_PART_NAMES.map(\n ([jointNameA, jointNameB]) =>\n ([PART_IDS[jointNameA],
PART_IDS[jointNameB]]);\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from
 './types';\n\nexport function getScale(\n [height, width]: [number, number],\n [inputResolutionY,
inputResolutionX]: [number, number],\n padding: Padding): [number, number] {\n const {top: padT, bottom:
padB, left: padL, right: padR} = padding;\n const scaleY = inputResolutionY / (padT + padB + height);\n const
scaleX = inputResolutionX / (padL + padR + width);\n return [scaleX, scaleY];\n}\n\nexport function
getOffsetPoint(\n y: number, x: number, keypoint: number, offsets: TensorBuffer3D): Vector2D {\n return {\n
y: offsets.get(y, x, keypoint),\n x: offsets.get(y, x, keypoint + NUM_KEYPOINTS)\n };\n}\n\nexport function
getImageCoords(\n part: Part, outputStride: number, offsets: TensorBuffer3D): Vector2D {\n const {heatmapY,
heatmapX, id: keypoint} = part;\n const {y, x} = getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n return
{\n x: part.heatmapX * outputStride + x,\n y: part.heatmapY * outputStride + y\n };\n}\n\nexport function
fillArray<T>(element: T, size: number): T[] {\n const result: T[] = new Array(size);\n\n for (let i = 0; i < size; i++)
{\n result[i] = element;\n }\n\n return result;\n}\n\nexport function clamp(a: number, min: number, max:
number): number {\n if (a < min) {\n return min;\n }\n if (a > max) {\n return max;\n }\n return
a;\n}\n\nexport function squaredDistance(\n y1: number, x1: number, y2: number, x2: number): number {\n const
dy = y2 - y1;\n const dx = x2 - x1;\n return dy * dy + dx * dx;\n}\n\nexport function addVectors(a: Vector2D, b:
Vector2D): Vector2D {\n return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a: Vector2D, min:
number, max: number): Vector2D {\n return {y: clamp(a.y, min, max), x: clamp(a.x, min, max)};\n}\n", "/*\n *
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=====
*\n\nimport {NUM_KEYPOINTS} from './keypoints';\nimport {Padding, Pose} from './types';\n\nimport
{getScale} from './util';\n\ninterface Pair {\n x: number;\n y: number;\n}\n\nfunction computeDistance(embedding:
Pair[], pose: Pose, minPartScore = 0.3) {\n let distance = 0.0;\n let numKpt = 0;\n for (let p = 0; p <
embedding.length; p++) {\n if (pose.keypoints[p].score > minPartScore) {\n numKpt += 1;\n distance +=
(embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n (embedding[p].y - pose.keypoints[p].position.y) **
2;\n }\n }\n\n if (numKpt === 0) {\n distance = Infinity;\n } else {\n distance = distance / numKpt;\n }\n\n
return distance;\n}\n\nfunction convertToPositionInOutput(\n position: Pair, [padT, padL]: [number, number],\n
[scaleX, scaleY]: [number, number], stride: number): Pair {\n const y = Math.round(((padT + position.y + 1.0) *
scaleY - 1.0) / stride);\n const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n return {x,
y};\n}\n\nfunction getEmbedding(\n location: Pair, keypointIndex: number,\n convertToPosition: (pair: Pair) =>
Pair, outputResolutionX: number,\n longOffsets: Float32Array, refineSteps: number,\n [height, width]: [number,
number]): Pair {\n const newLocation = convertToPosition(location);\n const nn = newLocation.y *
outputResolutionX + newLocation.x;\n let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n let

```

```

dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];
let y = location.y + dy;
let x = location.x + dx;
for (let t = 0; t < refineSteps; t++) {
 y = Math.min(y, height - 1);
 x = Math.min(x, width - 1);
 const newPos = convertToPosition({x, y});
 const nn = newPos.y * outputResolutionX + newPos.x;
 dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];
 dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];
 y = y + dy;
 x = x + dx;
}
return {x, y};
}

function matchEmbeddingToInstance(
 location: Pair, longOffsets: Float32Array, poses: Pose[],
 numKptForMatching: number, [padT, padL]: [number, number],
 [scaleX, scaleY]: [number, number], outputResolutionX: number,
 [height, width]: [number, number], stride: number,
 refineSteps: number): number {
 const embed: Pair[] = [];
 const convertToPosition = (pair: Pair) =>
 convertToPositionInOutput(pair, [padT, padL], [scaleX, scaleY],
 stride);
 for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;
 keypointsIndex++) {
 const embedding = getEmbedding(
 location, keypointsIndex, convertToPosition, outputResolutionX,
 longOffsets, refineSteps, [height, width]);
 embed.push(embedding);
 }
 let kMin = -1;
 let kMinDist = Infinity;
 for (let k = 0; k < poses.length; k++) {
 const dist = computeDistance(embed, poses[k]);
 if (dist < kMinDist) {
 kMin = k;
 kMinDist = dist;
 }
 }
 return kMin;
}

function getOutputResolution(
 [inputResolutionY, inputResolutionX]: [number, number],
 stride: number): [number, number] {
 const outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);
 const outputResolutionY = Math.round((inputResolutionY - 1.0) / stride + 1.0);
 return [outputResolutionX, outputResolutionY];
}

export function decodeMultipleMasksCPU(
 segmentation: Uint8Array, longOffsets: Float32Array,
 posesAboveScore: Pose[], height: number, width: number, stride: number,
 [inHeight, inWidth]: [number, number], padding: Padding,
 refineSteps: number, numKptForMatching = 5): Uint8Array[] {
 const dataArrays =
 posesAboveScore.map(x => new Uint8Array(height * width).fill(0));
 const {top: padT, left: padL} = padding;
 const [scaleX, scaleY] =
 getScale([height, width], [inHeight, inWidth], padding);
 const [outputResolutionX,] =
 getOutputResolution([inHeight, inWidth], stride);
 for (let i = 0; i < height; i += 1) {
 for (let j = 0; j < width; j += 1) {
 const n = i * width + j;
 const prob = segmentation[n];
 if (prob === 1) {
 const kMin = matchEmbeddingToInstance(
 {x: j, y: i}, longOffsets, posesAboveScore,
 numKptForMatching, [padT, padL], [scaleX, scaleY], outputResolutionX,
 [height, width], stride, refineSteps);
 if (kMin >= 0) {
 dataArrays[kMin][n] = 1;
 }
 }
 }
 }
 return dataArrays;
}

export function decodeMultiplePartMasksCPU(
 segmentation: Uint8Array, longOffsets: Float32Array,
 partSegmentaion: Uint8Array, posesAboveScore: Pose[], height: number,
 width: number, stride: number, [inHeight, inWidth]: [number, number],
 padding: Padding, refineSteps: number, numKptForMatching = 5): Int32Array[] {
 const dataArrays =
 posesAboveScore.map(x => new Int32Array(height * width).fill(-1));
 const {top: padT, left: padL} = padding;
 const [scaleX, scaleY] =
 getScale([height, width], [inHeight, inWidth], padding);
 const [outputResolutionX,] =
 getOutputResolution([inHeight, inWidth], stride);
 for (let i = 0; i < height; i += 1) {
 for (let j = 0; j < width; j += 1) {
 const n = i * width + j;
 const prob = segmentation[n];
 if (prob === 1) {
 const kMin = matchEmbeddingToInstance(
 {x: j, y: i}, longOffsets, posesAboveScore, numKptForMatching,
 [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],
 stride, refineSteps);
 if (kMin >= 0) {
 dataArrays[kMin][n] = partSegmentaion[n];
 }
 }
 }
 }
 return dataArrays;
}

```

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```

=====
* import * as tf from '@tensorflow/tfjs-core';
import * as tf_webgl from '@tensorflow/tfjs-backend-webgl';
import {NUM_KEYPOINTS} from '../keypoints';
import {Padding, Pose} from './types';

```

```

{getScale} from './util';\n\nexport function decodeMultipleMasksWebGl(\n segmentation: tf.Tensor2D,\n longOffsets: tf.Tensor3D,\n posesAboveScore: Pose[], height: number, width: number, stride: number,\n [inHeight, inWidth]: [number, number], padding: Padding,\n refineSteps: number, minKptScore: number,\n maxNumPeople: number): tf.TensorInfo {\n // The height/width of the image/canvas itself.\n const [origHeight, origWidth] = segmentation.shape;\n // The height/width of the output of the model.\n const [outHeight, outWidth] = longOffsets.shape.slice(0, 2);\n const shapedLongOffsets: tf.Tensor4D =\n tf.reshape(longOffsets, [outHeight, outWidth, 2, NUM_KEYPOINTS]);\n // Make pose tensor of shape [MAX_NUM_PEOPLE, NUM_KEYPOINTS, 3] where\n // the last 3 coordinates correspond to the score, h and w coordinate of that\n // keypoint.\n const poseVals = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i = 0; i < posesAboveScore.length; i++) {\n const poseOffset = i * NUM_KEYPOINTS * 3;\n const pose = posesAboveScore[i];\n for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n const keypoint = pose.keypoints[kp];\n const offset = poseOffset + kp * 3;\n poseVals[offset] = keypoint.score;\n poseVals[offset + 1] = keypoint.position.y;\n poseVals[offset + 2] = keypoint.position.x;\n }\n }\n const [scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n const posesTensor = tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n const {top: padT, left: padL} = padding;\n const program: tf_webgl.GPGPUProgram = {\n variableNames: ['segmentation', 'longOffsets', 'poses'],\n outputShape: [origHeight, origWidth],\n userCode: `\n int convertToPositionInOut(int pos, int pad, float scale, int stride) {\n return round(((float(pos + pad) + 1.0) * scale - 1.0) / float(stride));\n }\n\n float convertToPositionInOutFloat(\n int pos, int pad, float scale, int stride) {\n return ((float(pos + pad) + 1.0) * scale - 1.0) / float(stride);\n }\n\n float dist(float x1, float y1, float x2, float y2) {\n return pow(x1 - x2, 2.0) + pow(y1 - y2, 2.0);\n }\n\n float sampleLongOffsets(float h, float w, int d, int k) {\n float fh = fract(h);\n float fw = fract(w);\n int cIH = int(ceil(h));\n int cIW = int(ceil(w));\n int fIH = int(floor(h));\n int fIW = int(floor(w));\n float o11 = getLongOffsets(fIH, fIW, d, k);\n float o12 = getLongOffsets(fIH, cIW, d, k);\n float o21 = getLongOffsets(cIH, fIW, d, k);\n float o22 = getLongOffsets(cIH, cIW, d, k);\n float o1 = mix(o11, o12, fw);\n float o2 = mix(o21, o22, fw);\n return mix(o1, o2, fh);\n }\n\n int findNearestPose(int h, int w) {\n float prob = getSegmentation(h, w);\n if (prob < 1.0) {\n return -1;\n }\n // Done(Tyler): convert from output space h/w to strided space.\n float stridedH = convertToPositionInOutFloat(\n h, ${padT}, ${scaleY}, ${stride});\n float stridedW = convertToPositionInOutFloat(\n w, ${padL}, ${scaleX}, ${stride});\n float minDist = 1000000.0;\n int iMin = -1;\n for (int i = 0; i < ${maxNumPeople}; i++) {\n float curDistSum = 0.0;\n int numKpt = 0;\n for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n float dy = sampleLongOffsets(stridedH, stridedW, 0, k);\n float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n float y = float(h) + dy;\n float x = float(w) + dx;\n for (int s = 0; s < ${refineSteps}; s++) {\n int yRounded = round(min(y, float(${height} - 1.0)));\n int xRounded = round(min(x, float(${width} - 1.0)));\n float yStrided = convertToPositionInOutFloat(\n yRounded, ${padT}, ${scaleY}, ${stride});\n float xStrided = convertToPositionInOutFloat(\n xRounded, ${padL}, ${scaleX}, ${stride});\n float dy = sampleLongOffsets(yStrided, xStrided, 0, k);\n float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n y = y + dy;\n x = x + dx;\n }\n float poseScore = getPoses(i, k, 0);\n float poseY = getPoses(i, k, 1);\n float poseX = getPoses(i, k, 2);\n if (poseScore > ${minKptScore}) {\n numKpt = numKpt + 1;\n curDistSum = curDistSum + dist(x, y, poseX, poseY);\n }\n }\n if (numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n minDist = curDistSum / float(numKpt);\n iMin = i;\n }\n }\n return iMin;\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n int nearestPose = findNearestPose(coords[0], coords[1]);\n setOutput(float(nearestPose));\n }\n `;\n const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;\n return webglBackend.compileAndRun(\n program, [segmentation, shapedLongOffsets, posesTensor]);\n }\n /**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

```

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```
=====\n*\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport { getBackend } from '@tensorflow/tfjs-core';\nimport { Padding, PartSegmentation, PersonSegmentation, Pose } from '../types';\nimport { decodeMultipleMasksCPU, decodeMultiplePartMasksCPU } from './decode_multiple_masks_cpu';\nimport { decodeMultipleMasksWebGl } from './decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n segmentation: tf.Tensor2D, k: number): tf.Tensor2D {\n return tf.tidy(() => (tf.cast(tf.equal(segmentation, tf.scalar(k)), 'int32') as tf.Tensor2D));\n}\n\nexport function toPersonKPartSegmentation(\n segmentation: tf.Tensor2D, bodyParts: tf.Tensor2D, k: number): tf.Tensor2D {\n return tf.tidy(() => tf.sub(tf.mul(tf.cast(tf.equal(segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));\n}\n\nfunction isWebGlBackend() {\n return getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n height: number, width: number, stride: number, [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n refineSteps = 8, minKeypointScore = 0.3, maxNumPeople = 10): Promise<PersonSegmentation[]> {\n // Filter out poses with smaller score.\n const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n let personSegmentationsData: Uint8Array[];\n if (isWebGlBackend()) {\n const personSegmentations = tf.tidy(() => {\n const masksTensorInfo = decodeMultipleMasksWebGl(\n segmentation, longOffsets, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps, minKeypointScore, maxNumPeople);\n const masksTensor = tf.engine().makeTensorFromDataId(\n masksTensorInfo.dataId, masksTensorInfo.shape, masksTensorInfo.dtype) as tf.Tensor2D;\n return posesAboveScore.map((_, k) => toPersonKSegmentation(masksTensor, k));\n });\n personSegmentationsData = (await Promise.all(personSegmentations.map(mask => mask.data()))) as Uint8Array[];\n } else {\n const segmentationsData = await segmentation.data() as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n personSegmentationsData = decodeMultipleMasksCPU(\n segmentationsData, longOffsetsData, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps);\n }\n return personSegmentationsData.map((data, i) => ({data, pose: posesAboveScore[i], width, height}));\n}\n\nexport async function decodePersonInstancePartMasks(\n segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, partSegmentation: tf.Tensor2D, poses: Pose[],\n height: number, width: number, stride: number, [inHeight, inWidth]: [number, number], padding: Padding,\n minPoseScore = 0.2, refineSteps = 8, minKeypointScore = 0.3, maxNumPeople = 10): Promise<PartSegmentation[]> {\n const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n let partSegmentationsByPersonData: Int32Array[];\n if (isWebGlBackend()) {\n const partSegmentations = tf.tidy(() => {\n const masksTensorInfo = decodeMultipleMasksWebGl(\n segmentation, longOffsets, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps, minKeypointScore, maxNumPeople);\n const masksTensor = tf.engine().makeTensorFromDataId(\n masksTensorInfo.dataId, masksTensorInfo.shape, masksTensorInfo.dtype) as tf.Tensor2D;\n return posesAboveScore.map((_, k) => toPersonKPartSegmentation(masksTensor, partSegmentation, k));\n });\n partSegmentationsByPersonData = (await Promise.all(partSegmentations.map(x => x.data()))) as Int32Array[];\n } else {\n const segmentationsData = await segmentation.data() as Uint8Array;\n const longOffsetsData = await longOffsets.data() as Float32Array;\n const partSegmentaionData = await partSegmentation.data() as Uint8Array;\n partSegmentationsByPersonData = decodeMultiplePartMasksCPU(\n segmentationsData, longOffsetsData, partSegmentaionData, posesAboveScore, height, width, stride, [inHeight, inWidth], padding, refineSteps);\n }\n return partSegmentationsByPersonData.map((data, k) => ({pose: posesAboveScore[k], data, height, width}));\n}\n\n"/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
```

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```
=====
*\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n//
https://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n return Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n private priorityQueue: T[];\n private numberOfElements: number;\n private getElementValue: (element: T) => number;\n\n constructor(maxSize: number, getElementValue: (element: T) => number) {\n this.priorityQueue = new Array(maxSize);\n this.numberOfElements = -1;\n this.getElementValue = getElementValue;\n }\n\n public enqueue(x: T): void {\n this.priorityQueue[++this.numberOfElements] = x;\n this.swim(this.numberOfElements);\n }\n\n public dequeue(): T {\n const max = this.priorityQueue[0];\n this.exchange(0, this.numberOfElements--);\n this.sink(0);\n this.priorityQueue[this.numberOfElements + 1] = null;\n return max;\n }\n\n public empty(): boolean {\n return this.numberOfElements === -1;\n }\n\n public size(): number {\n return this.numberOfElements + 1;\n }\n\n public all(): T[] {\n return this.priorityQueue.slice(0, this.numberOfElements + 1);\n }\n\n public max(): T {\n return this.priorityQueue[0];\n }\n\n private swim(k: number): void {\n while (k > 0 && this.less(half(k), k)) {\n this.exchange(k, half(k));\n k = half(k);\n }\n }\n\n private sink(k: number): void {\n while (2 * k <= this.numberOfElements) {\n let j = 2 * k;\n if (j < this.numberOfElements && this.less(j, j + 1)) {\n j++;\n }\n if (!this.less(k, j)) {\n break;\n }\n this.exchange(k, j);\n k = j;\n }\n }\n\n private getValueAt(i: number): number {\n return this.getElementValue(this.priorityQueue[i]);\n }\n\n private less(i: number, j: number): boolean {\n return this.getValueAt(i) < this.getValueAt(j);\n }\n\n private exchange(i: number, j: number): void {\n const t = this.priorityQueue[i];\n this.priorityQueue[i] = this.priorityQueue[j];\n this.priorityQueue[j] = t;\n }\n}\n\n",/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
=====
```

```
import {PartWithScore, TensorBuffer3D} from '../types';\nimport {MaxHeap} from './max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n keypointId: number, score: number, heatmapY: number, heatmapX: number,\n localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n const [height, width] = scores.shape;\n\n let localMaximum = true;\n const yStart = Math.max(heatmapY - localMaximumRadius, 0);\n const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n for (let yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n const xStart = Math.max(heatmapX - localMaximumRadius, 0);\n const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n for (let xCurrent = xStart; xCurrent < xEnd; ++xCurrent) {\n if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n localMaximum = false;\n break;\n }\n }\n if (!localMaximum) {\n break;\n }\n }\n return localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a single priority queue across all parts.\n */\nexport function buildPartWithScoreQueue(\n scoreThreshold: number, localMaximumRadius: number,\n scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n const [height, width, numKeypoints] = scores.shape;\n const queue = new MaxHeap<PartWithScore>(\n height * width * numKeypoints, ({score}) => score);\n for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n for (let
```

```

heatmapX = 0; heatmapX < width; ++heatmapX) {
 for (let keypointId = 0; keypointId < numKeypoints;
 ++keypointId) {
 const score = scores.get(heatmapY, heatmapX, keypointId);
 // Only consider parts with score greater or equal to threshold as
 // root candidates.
 if (score < scoreThreshold) {
 continue;
 }
 // Only consider keypoints whose score is maximum in a local window.
 if (scoreIsMaximumInLocalWindow(
 keypointId, score, heatmapY, heatmapX, localMaximumRadius,
 scores)) {
 queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});
 }
 }
}
return queue;
}
"/**
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 * permissions and limitations under the License.
 */
=====
*/
import {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from './keypoints';
import {Keypoint, PartWithScore, TensorBuffer3D, Vector2D} from './types';
import {clamp, getOffsetPoint} from './util';
import {addVectors, getImageCoords} from './util';
const parentChildrenTuples: NumberTuple[] =
POSE_CHAIN.map(
 ([parentJoinName, childJoinName]): NumberTuple =>
 ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]);
const parentToChildEdges: number[] =
parentChildrenTuples.map(
 ([, childJointId]) => childJointId);
const childToParentEdges: number[] =
parentChildrenTuples.map(
 ([parentJointId, ,]) =>
 parentJointId);
function getDisplacement(
 edgeId: number, point: Vector2D, displacements:
 TensorBuffer3D): Vector2D {
 const numEdges = displacements.shape[2] / 2;
 return {
 y: displacements.get(point.y, point.x, edgeId),
 x: displacements.get(point.y, point.x, numEdges + edgeId)
 };
}
function getStridedIndexNearPoint(
 point: Vector2D, outputStride: number, height: number, width:
 number): Vector2D {
 return {
 y: clamp(Math.round(point.y / outputStride), 0, height - 1),
 x: clamp(Math.round(point.x / outputStride), 0, width - 1)
 };
}
/**
 * We get a new keypoint along the `edgeId` for the pose instance, assuming
 * that the position of the `idSource` part is already known. For this, we
 * follow the displacement vector from the source to target part (stored in
 * the `i`-th channel of the displacement tensor). The displaced keypoint
 * vector is refined using the offset vector by `offsetRefineStep` times.
 */
function traverseToTargetKeypoint(
 edgeId: number, sourceKeypoint: Keypoint, targetKeypointId:
 number, scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D, outputStride:
 number, displacements: TensorBuffer3D, offsetRefineStep = 2): Keypoint {
 const [height, width] = scoresBuffer.shape;
 // Nearest neighbor interpolation for the source->target displacements.
 const sourceKeypointIndices =
 getStridedIndexNearPoint(
 sourceKeypoint.position, outputStride, height, width);
 const displacement =
 getDisplacement(edgeId, sourceKeypointIndices, displacements);
 const displacedPoint =
 addVectors(sourceKeypoint.position, displacement);
 let targetKeypoint = displacedPoint;
 for (let i = 0; i < offsetRefineStep; i++) {
 const targetKeypointIndices =
 getStridedIndexNearPoint(targetKeypoint,
 outputStride, height, width);
 const offsetPoint = getOffsetPoint(
 targetKeypointIndices.y,
 targetKeypointIndices.x, targetKeypointId,
 offsets);
 targetKeypoint = addVectors(
 {
 x: targetKeypointIndices.x * outputStride,
 y: targetKeypointIndices.y * outputStride
 },
 {
 x: offsetPoint.x, y: offsetPoint.y
 });
 }
 const targetKeypointIndices =
 getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);
 const score = scoresBuffer.get(
 targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId);
 return {position: targetKeypoint, part:
 PART_NAMES[targetKeypointId], score};
}
/**
 * Follows the displacement fields to decode the full pose of the object
 * instance given the position of a part that acts as root.
 */
@return An array of decoded keypoints and their scores for a single pose
export function decodePose(
 root: PartWithScore, scores: TensorBuffer3D, offsets: TensorBuffer3D,
 outputStride: number, displacementsFwd: TensorBuffer3D,

```



```

displacementsBwd: TensorBuffer3D): Keypoint[] {\n const numParts = scores.shape[2];\n const numEdges =
parentToChildEdges.length;\n const instanceKeypoints: Keypoint[] = new Array(numParts);\n // Start a new
detection instance at the position of the root.\n const {part: rootPart, score: rootScore} = root;\n const rootPoint =
getImageCoords(rootPart, outputStride, offsets);\n instanceKeypoints[rootPart.id] = {\n score: rootScore,\n
part: PART_NAMES[rootPart.id],\n position: rootPoint\n };\n // Decode the part positions upwards in the tree,
following the backward\n // displacements.\n for (let edge = numEdges - 1; edge >= 0; --edge) {\n const
sourceKeypointId = parentToChildEdges[edge];\n const targetKeypointId = childToParentEdges[edge];\n if
(instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n
instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge,\n
instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsBwd);\n
}\n }\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let
edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const
targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n
instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n
offsets, outputStride,\n displacementsFwd);\n }\n }\n return instanceKeypoints;\n}\n\n"/**\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {Keypoint, Pose, TensorBuffer3D} from '../types';\nimport {buildPartWithScoreQueue} from
'/build_part_with_score_queue';\nimport {decodePose} from '/decode_pose';\nimport {getImageCoords,
squaredDistance} from '/util';\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[],\n squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return
poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return
squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <= \n
squaredNmsRadius;\n });\n}\n\n/* Score the newly proposed object instance without taking into account\n * the
scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let
notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number =>
{\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position,\n
keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n return
notOverlappedKeypointScores / instanceKeypoints.length;\n}\n\n// A point (y, x) is considered as root part
candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <= \n//
kLocalMaximumRadius.\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts
from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in
decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima
above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of
the queue (in decreasing score order)\n * and treat it as a root candidate for a new object instance. To avoid\n *
duplicate detections, we reject the root candidate if it is within a disk\n * of `nmsRadius` pixels from the
corresponding part of a previously detected\n * instance, which is a form of part-based non-maximum suppression
(NMS). If\n * the root candidate passes the NMS check, we start a new object instance\n * detection, treating the
corresponding part as root and finding the\n * positions of the remaining parts by following the displacement
vectors\n * along the tree-structured part graph. We assign to the newly detected\n * instance a score equal to the
sum of scores of its parts which have not\n * been claimed by a previous instance (i.e., those at least `nmsRadius`\n

```



software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\n\nconst RESNET50_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/resnet50';\nconst MOBILENET_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet';\n\n// The BodyPix 2.0 ResNet50 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number, quantBytes: number): string {\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return RESNET50_BASE_URL + `float` + graphJson;\n } else {\n return RESNET50_BASE_URL + `quant${quantBytes}` + graphJson;\n }\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function mobileNetSavedModel(stride: number, multiplier: number, quantBytes: number): string {\n const toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return MOBILENET_BASE_URL + `float/${toStr[multiplier]}` + graphJson;\n } else {\n return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}` +\n graphJson;\n }\n}\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

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\nimport * as tf from '@tensorflow/tfjs-core';\nimport {BodyPixInput, BodyPixOutputStride, Padding} from './types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from './types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\nHTMLCanvasElement|\nOffscreenCanvas): [number, number] {\n if ('offsetHeight' in input && input.offsetHeight !== 0\n && 'offsetWidth' in input && input.offsetWidth !== 0) {\n return [input.offsetHeight, input.offsetWidth];\n } else if (input.height != null && input.width != null) {\n return [input.height, input.width];\n } else {\n throw new Error(`HTMLImageElement must have height and width attributes set.`);\n }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number, number] {\n if (input.hasAttribute('height') && input.hasAttribute('width')) {\n // Prioritizes user specified height and width.\n // We can't test the .height and .width properties directly,\n // because they evaluate to 0 if unset.\n return [input.height, input.width];\n } else {\n return [input.videoHeight, input.videoWidth];\n }\n}\n\nexport function getInputSize(input: BodyPixInput): [number, number] {\n if ((typeof (HTMLCanvasElement) !== 'undefined' &&\n input instanceof HTMLCanvasElement) ||\n (typeof (OffscreenCanvas) !== 'undefined' &&\n input instanceof OffscreenCanvas) ||\n (typeof (HTMLImageElement) !== 'undefined' &&\n input instanceof HTMLImageElement)) {\n return getSizeFromImageLikeElement(input);\n } else if (typeof (ImageData) !== 'undefined' && input instanceof ImageData) {\n return [input.height, input.width];\n } else if (typeof (HTMLVideoElement) !== 'undefined' &&\n input instanceof HTMLVideoElement) {\n return getSizeFromVideoElement(input);\n } else if (input instanceof tf.Tensor) {\n return [input.shape[0], input.shape[1]];\n } else {\n throw new Error(`error: Unknown input type: ${input}`);\n }\n}\n\nfunction isValidInputResolution(resolution: number, outputStride: number): boolean {\n return (resolution - 1) % outputStride === 0;\n}\n\nexport function toValidInputResolution(inputResolution: number, outputStride: BodyPixOutputStride): number {\n if (isValidInputResolution(inputResolution, outputStride)) {\n return inputResolution;\n } else {\n return Math.floor(inputResolution / outputStride) * outputStride + 1;\n }\n}\n\nconst INTERNAL_RESOLUTION_STRING_OPTIONS = {\n low: 'low',\n medium: 'medium',\n high: 'high',\n full:\n
```

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'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n
[INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION =
0.1;\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n
internalResolution: BodyPixInternalResolution): number {\n if (typeof internalResolution === 'string') {\n const
result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n\n tf.util.assert(\n typeof result
=== 'number',\n () => `string value of inputResolution must be one of ${\n
Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n .join(',')\n } but was
${internalResolution}.`);\n return result;\n } else {\n tf.util.assert(\n typeof internalResolution === 'number'
&&\n internalResolution <= MAX_INTERNAL_RESOLUTION &&\n internalResolution >=
MIN_INTERNAL_RESOLUTION,\n () =>\n `inputResolution must be a string or number between ${\n
MIN_INTERNAL_RESOLUTION\n } and ${MAX_INTERNAL_RESOLUTION}, but ` +\n `was
${internalResolution}`);\n\n return internalResolution;\n }\n}\n\nexport function
toInputResolutionHeightAndWidth(\n internalResolution: BodyPixInternalResolution,\n outputStride:
BodyPixOutputStride,\n [inputHeight, inputWidth]: [number, number]): [number, number] {\n const
internalResolutionPercentage =\n toInternalResolutionPercentage(internalResolution);\n\n return [\n
toValidInputResolution(\n inputHeight * internalResolutionPercentage, outputStride),\n
toValidInputResolution(\n inputWidth * internalResolutionPercentage, outputStride)\n];\n}\n\nexport function
toInputTensor(input: BodyPixInput) {\n // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n //
@ts-ignore\n return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\nexport function
resizeAndPadTo(\n imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n flipHorizontal = false):
{\n resizedAndPadded: tf.Tensor3D,\n paddedBy: [[number, number], [number, number]]\n} {\n const [height,
width] = imageTensor.shape;\n\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n\n let
resizeW: number;\n let resizeH: number;\n let padL: number;\n let padR: number;\n let padT: number;\n let
padB: number;\n\n if (aspect > targetAspect) {\n // resize to have the larger dimension match the shape.\n
resizeW = targetW;\n resizeH = Math.ceil(resizeW / aspect);\n\n const padHeight = targetH - resizeH;\n padL
= 0;\n padR = 0;\n padT = Math.floor(padHeight / 2);\n padB = targetH - (resizeH + padT);\n } else {\n
resizeH = targetH;\n resizeW = Math.ceil(targetH * aspect);\n\n const padWidth = targetW - resizeW;\n padL
= Math.floor(padWidth / 2);\n padR = targetW - (resizeW + padL);\n padT = 0;\n padB = 0;\n }\n\n const
resizedAndPadded = tf.tidy(() => {\n // resize to have largest dimension match image\n let resized:
tf.Tensor3D;\n\n if (flipHorizontal) {\n resized = tf.image.resizeBilinear(\n tf.reverse(imageTensor, 1),
[resizeH, resizeW]);\n } else {\n resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n }\n\n
const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n\n return padded;\n });\n\n return
{resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n}\n\nexport function
scaleAndCropToInputTensorShape(\n tensor: tf.Tensor3D,\n [inputTensorHeight, inputTensorWidth]: [number,
number],\n [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n [[padT, padB], [padL,
padR]]: [[number, number], [number, number]],\n applySigmoidActivation = false): tf.Tensor3D {\n return
tf.tidy(() => {\n let inResizedAndPadded: tf.Tensor3D = tf.image.resizeBilinear(tensor,\n
[resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n\n if (applySigmoidActivation) {\n
inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n }\n\n return removePaddingAndResizeBack(\n
inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n [[padT, padB], [padL, padR]]);\n });\n}\n\nexport function removePaddingAndResizeBack(\n
resizedAndPadded: tf.Tensor3D,\n [originalHeight, originalWidth]: [number, number],\n [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n
tf.Tensor3D {\n return tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n
return tf.squeeze(tf.image\n .cropAndResize(\n batchedImage, [[\n padT / (originalHeight +
padT + padB - 1.0),\n padL / (originalWidth + padL + padR - 1.0),\n (padT + originalHeight - 1.0)

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\n (originalHeight + padT + padB - 1.0),\n (padL + originalWidth - 1.0) / (originalWidth + padL
+ padR - 1.0)\n]],\n [0], [originalHeight, originalWidth], [0]);\n });\n\n\nexport function resize2d(\n tensor: tf.Tensor2D, resolution: [number, number],\n nearestNeighbor?: boolean): tf.Tensor2D {\n return
tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(tensor, 2);\n return tf.squeeze(\n
tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n });\n\n\nexport function
padAndResizeTo(\n input: BodyPixInput, [targetH, targetW]: [number, number]):\n {resized: tf.Tensor3D,
padding: Padding} {\n const [height, width] = getInputSize(input);\n const targetAspect = targetW / targetH;\n
const aspect = width / height;\n let [padT, padB, padL, padR] = [0, 0, 0, 0];\n if (aspect < targetAspect) {\n
// pads the width\n padT = 0;\n padB = 0;\n padL = Math.round(0.5 * (targetAspect * height - width));\n
padR = Math.round(0.5 * (targetAspect * height - width));\n } else {\n // pads the height\n padT = Math.round(0.5 *
((1.0 / targetAspect) * width - height));\n padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n
padL = 0;\n padR = 0;\n }\n\n const resized: tf.Tensor3D = tf.tidy(() => {\n let imageTensor =
toInputTensor(input);\n imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n return
tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n });\n\n return {resized, padding: {top: padT, left: padL,
right: padR, bottom: padB}};\n });\n\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\n Promise<TensorBuffer3D[]> {\n return Promise.all(tensors.map(tensor => tensor.buffer()));\n}\n\n\nexport function
scalePose(\n pose: Pose, scaleY: number, scaleX: number, offsetY = 0,\n offsetX = 0): Pose {\n return {\n score: pose.score,\n keypoints: pose.keypoints.map(({score, part, position}) => ({\n
score,\n part,\n position: {\n x: position.x * scaleX +
offsetX,\n y: position.y * scaleY + offsetY\n }\n })))\n };\n}\n\n\nexport function scalePoses(\n poses: Pose[],
scaleY: number, scaleX: number, offsetY = 0, offsetX = 0) {\n if (scaleX === 1 && scaleY === 1 && offsetY === 0 &&
offsetX === 0) {\n return poses;\n }\n return
poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n}\n\n\nexport function
flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n return {\n score: pose.score,\n keypoints:
pose.keypoints.map(\n ({score, part, position}) => ({\n score,\n part,\n position: {x:
imageWidth - 1 - position.x, y: position.y}\n })\n)\n };\n}\n\n\nexport function flipPosesHorizontal(poses: Pose[],
imageWidth: number) {\n if (imageWidth <= 0) {\n return poses;\n }\n return poses.map(pose =>
flipPoseHorizontal(pose, imageWidth));\n}\n\n\nexport function scaleAndFlipPoses(\n poses: Pose[], [height,
width]: [number, number],\n [inputResolutionHeight, inputResolutionWidth]: [number, number],\n padding:
Padding, flipHorizontal: boolean): Pose[] {\n const scaleY =\n (height + padding.top + padding.bottom) /
(inputResolutionHeight);\n const scaleX =\n (width + padding.left + padding.right) /
(inputResolutionWidth);\n\n const scaledPoses =\n scalePoses(poses, scaleY, scaleX, -padding.top, -
padding.left);\n\n if (flipHorizontal) {\n return flipPosesHorizontal(scaledPoses, width);\n } else {\n return
scaledPoses;\n }\n }\n}\n\n\n", "**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport
{BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation,
toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport
{decodePersonInstanceMasks, decodePersonInstancePartMasks} from
'./multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from
'./multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel,
resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput,

```

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BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from
'./types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation,
SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo,
scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D}
from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING =
false;\n\n/**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n * `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported
architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix
model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of
speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n
* stride 8,16,32 are supported for various MobileNetV1 models.\n *\n * `multiplier`: An optional number with
values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier
for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and
more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of
accuracy.\n *\n * `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for
area/countries that don't have access to the model hosted on\n * GCP.\n *\n * `quantBytes`: An optional number
with values: 1, 2, or 4. This parameter\n * affects weight quantization in the models. The available options are\n * 1
byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time,
the lower the value, the shorter the\n * loading time but lower the accuracy.\n */\nexport interface ModelConfig {\n
architecture: BodyPixArchitecture;\n outputStride: BodyPixOutputStride;\n multiplier?: BodyPixMultiplier;\n
modelUrl?: string;\n quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading
MobileNetV1 based BodyPix.\n// (And for references, the default configuration for loading ResNet\n// based
PoseNet is also included).\n// ``\n// const RESNET_CONFIG = {\n// architecture: 'ResNet50',\n//
outputStride: 32,\n// quantBytes: 4,\n// } as ModelConfig;\n// ``\n\nconst MOBILENET_V1_CONFIG = {\n
architecture: 'MobileNetV1',\n outputStride: 16,\n quantBytes: 4,\n multiplier: 0.75,\n} as ModelConfig;\n\nconst
VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];\nconst VALID_STRIDE: {[id:
string]: BodyPixOutputStride[]} = {\n 'MobileNetV1': [8, 16, 32],\n 'ResNet50': [32, 16]};\n\nconst
VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {\n 'MobileNetV1': [0.50, 0.75, 1.0],\n 'ResNet50':
[1.0]};\n\nconst VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];\n\nfunction
validateModelConfig(config: ModelConfig): ModelConfig {\n config = config || MOBILENET_V1_CONFIG;\n\n
if (config.architecture == null) {\n config.architecture = 'MobileNetV1';\n }\n\n
(VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {\n throw new Error(\n `Invalid architecture
${config.architecture}.` +\n `Should be one of ${VALID_ARCHITECTURE}`);\n }\n\n
if (config.outputStride == null) {\n config.outputStride = 16;\n }\n\n
if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {\n throw new Error(\n `Invalid
outputStride ${config.outputStride}.` +\n `Should be one of ${VALID_STRIDE[config.architecture]}` +\n
`for architecture ${config.architecture}.`);\n }\n\n
if (config.multiplier == null) {\n config.multiplier = 1.0;\n }\n\n
if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {\n throw new Error(\n
`Invalid multiplier ${config.multiplier}.` +\n `Should be one of
${VALID_MULTIPLIER[config.architecture]}` +\n `for architecture ${config.architecture}.`);\n }\n\n
if (config.quantBytes == null) {\n config.quantBytes = 4;\n }\n\n
if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {\n throw new Error(\n `Invalid quantBytes
${config.quantBytes}.` +\n `Should be one of ${VALID_QUANT_BYTES}` +\n `for architecture
${config.architecture}.`);\n }\n\n
return config;\n}\n\n/**\n * BodyPix inference is configurable using the
following config dictionary.\n *\n * `flipHorizontal`: If the left-right keypoint of poses/part segmentation\n * should
be flipped/mirrored horizontally. This should be set to true for\n * videos where the video is by default flipped
horizontally (i.e. a webcam),\n * and you want the person & body part segmentation to be returned in the proper\n
* orientation.\n *\n * `internalResolution`: Defaults to 'medium'. The internal resolution\n * percentage that the input

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is resized to before inference. The larger the `internalResolution` the more accurate the model at the cost of slower `prediction` times. Available values are 'low', 'medium', 'high', 'full', or a percentage value between 0 and 1. The values 'low', 'medium', 'high', and 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.

`segmentationThreshold`: The minimum that segmentation values must have to be considered part of the person. Affects the generation of the `segmentation` mask. More specifically, it is the threshold used to binarize the intermediate person segmentation probability. The probability of each pixel belongs to a person is in range [0, 1]. If the probability is greater than the `segmentationThreshold`, it will be set to 1 otherwise 0.

`PersonInferenceConfig` interface `InferenceConfig` { `flipHorizontal`: boolean; `internalResolution`: BodyPixInternalResolution; `segmentationThreshold`: number; }

`PersonInferenceConfig` { `maxDetections`: Defaults to 10. Maximum number of person pose detections per image. `scoreThreshold`: Defaults to 0.4. Only return person pose that have root part score greater or equal to this value. `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels. It needs to be strictly positive. Two pose keypoints suppress each other if they are less than `nmsRadius` pixels away. }

`MultiplePersonInstanceInferenceConfig` { `maxDetections`: Defaults to 10. Maximum number of returned instance segmentation and pose detections per image. `scoreThreshold`: Defaults to 0.4. Only returns and uses person poses for instance segmentation assignment when the pose has root part score greater or equal to this value. `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels. It needs to be strictly positive. Two parts suppress each other if they are less than `nmsRadius` pixels away. `minKeypointScore`: Default to 0.3. Keypoints above the score are used for matching and assigning segmentation mask to each person. `refineSteps`: Default to 10. The number of refinement steps used when assigning the instance segmentation. It needs to be strictly positive. The larger the higher the accuracy and slower the inference. }

`MultiPersonInstanceInferenceConfig` extends `InferenceConfig` { `maxDetections`: number; `scoreThreshold`: number; `nmsRadius`: number; `minKeypointScore`: number; `refineSteps`: number; }

`PERSON_INFERENCE_CONFIG`: `PersonInferenceConfig = { flipHorizontal: false, internalResolution: 'medium', segmentationThreshold: 0.7, maxDetections: 10, scoreThreshold: 0.4, nmsRadius: 20, }`

`MULTI_PERSON_INSTANCE_INFERENCE_CONFIG`: `MultiPersonInstanceInferenceConfig = { flipHorizontal: false, internalResolution: 'medium', segmentationThreshold: 0.7, maxDetections: 10, scoreThreshold: 0.4, nmsRadius: 20, minKeypointScore: 0.3, refineSteps: 10 }`

```

function validatePersonInferenceConfig(config: PersonInferenceConfig) {
 const { segmentationThreshold, maxDetections, scoreThreshold, nmsRadius } = config;
 if (segmentationThreshold < 0.0 || segmentationThreshold > 1.0) {
 throw new Error(`segmentationThreshold ${segmentationThreshold}. ` +
 `Should be in range [0.0, 1.0]`);
 }
 if (maxDetections <= 0) {
 throw new Error(`Invalid maxDetections ${maxDetections}. ` +
 `Should be > 0`);
 }
 if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {
 throw new Error(`Invalid scoreThreshold ${scoreThreshold}. ` +
 `Should be in range [0.0, 1.0]`);
 }
 if (nmsRadius <= 0) {
 throw new Error(`Invalid nmsRadius ${nmsRadius}.`);
 }
}

function validateMultiPersonInstanceInferenceConfig(
 config: MultiPersonInstanceInferenceConfig
) {
 const { segmentationThreshold, maxDetections, scoreThreshold, nmsRadius,
 minKeypointScore, refineSteps } = config;
 if (segmentationThreshold < 0.0 || segmentationThreshold >
 1.0) {
 throw new Error(`segmentationThreshold ${segmentationThreshold}. ` +
 `Should be in range [0.0, 1.0]`);
 }
 if (maxDetections <= 0) {
 throw new Error(`Invalid maxDetections ${maxDetections}. ` +
 `Should be > 0`);
 }
 if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {
 throw new Error(`Invalid scoreThreshold ${scoreThreshold}. ` +
 `Should be in range [0.0, 1.0]`);
 }
 if (nmsRadius <= 0) {
 throw new Error(`Invalid nmsRadius ${nmsRadius}.`);
 }
 if (minKeypointScore < 0 || minKeypointScore > 1) {
 throw new Error(`Invalid minKeypointScore ${minKeypointScore}. ` +
 `Should be in range [0.0, 1.0]`);
 }
 if (refineSteps <= 0 || refineSteps > 20) {
 throw new Error(`Invalid refineSteps ${refineSteps}. ` +
 `Should be in range [1, 20]`);
 }
}
export class BodyPix {

```

```

baseModel: BaseModel;\n\n constructor(net: BaseModel) {\n this.baseModel = net;\n }\n\n private
predictForPersonSegmentation(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n heatmapScores:
tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n }
{\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
} = this.baseModel.predict(input);\n return {\n segmentLogits: segmentation,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n segmentLogits: tf.Tensor3D,\n
partHeatmapLogits: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd:
tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n } {\n const {\n segmentation,\n partHeatmaps,\n
heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } = this.baseModel.predict(input);\n
return {\n segmentLogits: segmentation,\n partHeatmapLogits: partHeatmaps,\n heatmapScores,\n
offsets,\n displacementFwd,\n displacementBwd,\n };\n }\n\n private
predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n {\n segmentLogits:
tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n
displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n } {\n
const {\n segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd,\n partHeatmaps,\n } = this.baseModel.predict(input);\n return {\n segmentLogits:
segmentation,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n
partHeatmaps,\n };\n }\n\n /**\n * Given an image with people, returns a dictionary of all intermediate\n *
tensors including: 1) a binary array with 1 for the pixels that are part of\n * the person, and 0 otherwise, 2)
heatmapScores, 3) offsets, and 4) paddings.\n *\n * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed
through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal resolution\n * that
the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the
cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n * a percentage value
between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n
*\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered
part of the person. Affects the generation of the\n * segmentation mask.\n *\n * @return A dictionary containing
`segmentation`, `heatmapScores`, `offsets`,\n * and `padding`:\n * - `segmentation`: A 2d Tensor with 1 for the
pixels that are part of the\n * person, and 0 otherwise. The width and height correspond to the same\n *
dimensions of the input image.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * pose
estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n * estimation decoding.\n
*\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n * by pose estimation decoding.\n
*\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation
decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the
model.\n */\n segmentPersonActivation(\n input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n segmentation: tf.Tensor2D,\n
heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd:
tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n } {\n const
[height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n
const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n const {\n
segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } = tf.tidy(() =>
{\n const {\n segmentLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n
displacementBwd,\n } = this.predictForPersonSegmentation(resized);\n\n const [resizedHeight, resizedWidth]
= resized.shape;\n\n const scaledSegmentScores = scaleAndCropToInputTensorShape(\n segmentLogits,
[height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left,
padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n\n return {\n segmentation: toMaskTensor(\n

```



```

 tf.squeeze(scaledSegmentScores), segmentationThreshold),\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n });\n });\n resized.dispose();\n return {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n };\n }\n /**\n * Given an image with many people, returns a\n * PersonSegmentation dictionary\n * that contains the segmentation mask for all people and a single pose.\n * \n * Note: The segmentation mask returned by this method covers all people but\n * the pose works well for one\n * person. If you want to estimate instance-level\n * multiple person segmentation & pose for each person, use\n * `segmentMultiPerson` instead.\n * \n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed\n * through the network.\n * \n * @param config PersonInferenceConfig object that contains\n * parameters for the\n * BodyPix inference using person decoding.\n * \n * @return A SemanticPersonSegmentation dictionary that\n * contains height,\n * width, the flattened binary segmentation mask and the poses for all people.\n * The width and\n * height correspond to the same dimensions of the input image.\n * - `height`: The height of the segmentation data in\n * pixel unit.\n * - `width`: The width of the segmentation data in pixel unit.\n * - `data`: The flattened Uint8Array\n * of segmentation data. 1 means the pixel\n * belongs to a person and 0 means the pixel doesn't belong to a person.\n * The\n * size of the array is equal to `height` x `width` in row-major order.\n * - `allPoses`: The 2d poses of all\n * people.\n */\n async segmentPerson(\n input: BodyPixInput,\n config: PersonInferenceConfig =\n PERSON_INFERENCE_CONFIG):\n Promise<SemanticPersonSegmentation> {\n config =\n {...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n segmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonActivation(\n input,\n config.internalResolution, config.segmentationThreshold);\n const [height, width] = segmentation.shape;\n const result = await segmentation.data() as Uint8Array;\n segmentation.dispose();\n const tensorBuffers =\n await toTensorBuffers3D(\n [heatmapScores, offsets, displacementFwd, displacementBwd]);\n const\n [scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n let poses =\n decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses =\n scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n return {height, width, data: result, allPoses:\n poses};\n }\n /**\n * Given an image with multiple people, returns an *array* of\n * PersonSegmentation\n * object. Each element in the array corresponding to one\n * of the people in the input image. In other words, it\n * predicts\n * instance-level multiple person segmentation & pose for each person.\n * \n * The model does\n * standard ImageNet pre-processing before inferring through\n * the model. The image pixels should have values [0-\n * 255].\n * \n * @param input\n * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input\n * image to feed through the network.\n * \n * @param config MultiPersonInferenceConfig object\n * that contains\n * parameters for the BodyPix inference using multi-person decoding.\n * \n * @return An array of\n * PersonSegmentation object, each containing a width,\n * height, a binary array (1 for the pixels that are part of\n * the\n * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n * number of pixels in the\n * image. The width and height correspond to the\n * dimensions of the image the binary array is shaped to, which are\n * the same\n * dimensions of the input image.\n */\n async segmentMultiPerson(\n input: BodyPixInput,\n config: MultiPersonInstanceInferenceConfig =\n MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n Promise<PersonSegmentation[]> {\n config = {\n ...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG,\n ...config};\n validateMultiPersonInstanceInferenceConfig(config);\n const [height, width] =\n getInputSize(input);\n const internalResolutionHeightAndWidth =\n toInputResolutionHeightAndWidth(\n config.internalResolution, this.baseModel.outputStride,\n [height, width]);\n const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n const {\n segmentation,\n longOffsets,\n heatmapScoresRaw,\n offsetsRaw,\n displacementFwdRaw,\n displacementBwdRaw,\n } =\n tf.tidy(() =>

```

```

{\n const {\n segmentLogits,\n longOffsets,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n const longOffsetsResized = false;\n let scaledLongOffsets;\n if (longOffsetsResized) {\n scaledLongOffsets = scaleAndCropToInputTensorShape(\n longOffsets, [height, width],\n internalResolutionHeightAndWidth,\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n } else {\n scaledLongOffsets = longOffsets;\n }\n const
segmentation = toMaskTensor(\n tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n return {\n segmentation,\n longOffsets: scaledLongOffsets,\n heatmapScoresRaw: heatmapScores,\n offsetsRaw: offsets,\n displacementFwdRaw: displacementFwd,\n displacementBwdRaw:
displacementBwd,\n };}\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScoresRaw,\n offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n const [scoresBuf, offsetsBuf,\n displacementsFwdBuf, displacementsBwdBuf] =\n tensorBuffers;\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride,\n config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses = scaleAndFlipPoses(\n poses, [height, width], internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n const instanceMasks = await decodePersonInstanceMasks(\n segmentation, longOffsets, poses, height, width,\n this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n config.scoreThreshold,\n config.refineSteps, config.minKeypointScore,\n config.maxDetections);\n resized.dispose();\n segmentation.dispose();\n longOffsets.dispose();\n heatmapScoresRaw.dispose();\n offsetsRaw.dispose();\n displacementFwdRaw.dispose();\n displacementBwdRaw.dispose();\n return instanceMasks;\n } \n\n /**\n *
Given an image with many people, returns a dictionary containing: height,\n * width, a tensor with a part id from 0-24 for the pixels that are\n * part of a corresponding body part, and -1 otherwise. This does standard\n * ImageNet pre-processing before inferring through the model. The image\n * should pixels should have values [0-255].\n *\n * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement\n * The input image to feed through the network.\n *\n * @param internalResolution Defaults to 'medium'. The internal
resolution\n * percentage that the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the cost of slower\n * prediction times. Available values are 'low', 'medium', 'high',
'full',\n * or\n * a percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n *\n * @param segmentationThreshold The minimum that segmentation values
must have\n * to be considered part of the person. Affects the clipping of the colored\n * part image.\n *\n * @return A dictionary containing `partSegmentation`, `heatmapScores`,\n * `offsets`, and `padding`:\n * -\n * `partSegmentation`: A 2d Tensor with a part id from 0-24 for\n * the pixels that are part of a corresponding body part, and -1 otherwise.\n * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n * single-person pose estimation decoding.\n * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose\n * estimation decoding.\n * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement\n * used by pose estimation decoding.\n * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n * by pose estimation decoding.\n * - `padding`: The padding (unit pixels) being applied to the input image\n * before it is fed into the model.\n *\n */\n segmentPersonPartsActivation(\n input: BodyPixInput,\n internalResolution: BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n partSegmentation:
tf.Tensor2D,\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n padding: Padding,\n internalResolutionHeightAndWidth: [number, number]\n }\n {\n const [height, width] = getInputSize(input);\n const internalResolutionHeightAndWidth =
toInputResolutionHeightAndWidth(\n internalResolution, this.baseModel.outputStride, [height, width]);\n const {\n resized,\n padding,\n } = padAndResizeTo(input, internalResolutionHeightAndWidth);\n const
{\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } =

```

```

tf.tidy(() => {\n const {\n segmentLogits,\n partHeatmapLogits,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd\n } = this.predictForPersonSegmentationAndPart(resized);\n const [resizedHeight, resizedWidth] = resized.shape;\n const scaledSegmentScores =\n scaleAndCropToInputTensorShape(\n segmentLogits, [height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n partHeatmapLogits, [height, width],\n [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n const segmentation =\n toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n return {\n partSegmentation:\n decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n };}\n resized.dispose();\n return {\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n };}\n /**\n * Given an image with many people,\n returns a PartSegmentation dictionary that\n * contains the body part segmentation mask for all people and a single\n pose.\n *\n * Note: The body part segmentation mask returned by this method covers all\n * people but the pose\n works well when there is one person. If you want to\n * estimate instance-level multiple person body part\n segmentation & pose for\n * each person, use `segmentMultiPersonParts` instead.\n *\n * @param input\n ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n * The input image to feed\n through the network.\n *\n * @param config PersonInferenceConfig object that contains\n * parameters for the\n BodyPix inference using single person decoding.\n *\n * @return A SemanticPartSegmentation dictionary that\n contains height, width,\n * the flattened binary segmentation mask and the pose for the person. The\n * width and\n height correspond to the same dimensions of the input image.\n * - `height`: The height of the person part\n segmentation data in pixel unit.\n * - `width`: The width of the person part segmentation data in pixel unit.\n * -\n `data`: The flattened Int32Array of person part segmentation data with a\n * part id from 0-24 for the pixels that are\n part of a corresponding body\n * part, and -1 otherwise. The size of the array is equal to `height` x\n * `width` in\n row-major order.\n * - `allPoses`: The 2d poses of all people.\n */\n async segmentPersonParts(\n input:\n BodyPixInput,\n config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n Promise<SemanticPartSegmentation> {\n config = {...PERSON_INFERENCE_CONFIG, ...config};\n validatePersonInferenceConfig(config);\n const {\n partSegmentation,\n heatmapScores,\n offsets,\n displacementFwd,\n displacementBwd,\n padding,\n internalResolutionHeightAndWidth\n } =\n this.segmentPersonPartsActivation(\n input, config.internalResolution, config.segmentationThreshold);\n const [height, width] = partSegmentation.shape;\n const data = await partSegmentation.data() as Int32Array;\n partSegmentation.dispose();\n const tensorBuffers = await toTensorBuffers3D(\n [heatmapScores, offsets,\n displacementFwd, displacementBwd]);\n const [scoresBuf, offsetsBuf, displacementsFwdBuf,\n displacementsBwdBuf] =\n tensorBuffers;\n let poses = decodeMultiplePoses(\n scoresBuf, offsetsBuf,\n displacementsFwdBuf, displacementsBwdBuf,\n this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n poses = scaleAndFlipPoses(\n poses, [height, width],\n internalResolutionHeightAndWidth, padding,\n FLIP_POSES_AFTER_SCALING);\n heatmapScores.dispose();\n offsets.dispose();\n displacementFwd.dispose();\n displacementBwd.dispose();\n return {height, width, data, allPoses: poses};\n }\n /**\n * Given an image with multiple people, returns an\n *array* of PartSegmentation\n * object. Each element in the array corresponding to one\n * of the people in the\n input image. In other words, it predicts\n * instance-level multiple person body part segmentation & pose for\n each\n * person.\n *\n * This does standard ImageNet pre-processing before inferring through\n * the model.\n The image pixels should have values [0-255].\n *\n * @param input\n *\n ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n * image to feed\n through the network.\n *\n * @param config MultiPersonInferenceConfig object that contains\n * parameters for the\n BodyPix inference using multi-person decoding.\n *\n * @return An array of PartSegmentation object, each\n containing a width,\n * height, a flattened array (with part id from 0-24 for the pixels that are\n * part of a

```

corresponding body part, and -1 otherwise) and 2D pose. The width \* and height correspond to the dimensions of the image. Each flattened part \* segmentation array size is equal to `height` x `width`.\n \*/\n

```

async
segmentMultiPersonParts(\n
 input: BodyPixInput,\n
 config: MultiPersonInstanceInferenceConfig =>\n
 MULTI_PERSON_INSTANCE_INFERENCE_CONFIG): Promise<PartSegmentation[]> {\n
 config =
 {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n
 validateMultiPersonInstanceInferenceConfig(config);\n
 const [height, width] = getInputSize(input);\n
 const
 internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n
 config.internalResolution,
 this.baseModel.outputStride,\n
 [height, width]);\n
 const {resized, padding} =\n
 padAndResizeTo(input,
 internalResolutionHeightAndWidth);\n
 const {\n
 segmentation,\n
 longOffsets,\n
 heatmapScoresRaw,\n
 offsetsRaw,\n
 displacementFwdRaw,\n
 displacementBwdRaw,\n
 partSegmentation,\n
 } = tf.tidy(() =>
 {\n
 const {\n
 segmentLogits,\n
 longOffsets,\n
 heatmapScores,\n
 offsets,\n
 displacementFwd,\n
 displacementBwd,\n
 partHeatmaps\n
 } =
 this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n
 // decoding with scaling.\n
 const
 scaledSegmentScores = scaleAndCropToInputTensorShape(\n
 segmentLogits, [height, width],
 internalResolutionHeightAndWidth,\n
 [[padding.top, padding.bottom], [padding.left, padding.right]],\n
 APPLY_SIGMOID_ACTIVATION);\n
 // decoding with scaling.\n
 const scaledPartSegmentationScores =
 scaleAndCropToInputTensorShape(\n
 partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n
 [[padding.top, padding.bottom], [padding.left, padding.right]],\n
 APPLY_SIGMOID_ACTIVATION);\n
 const scaledLongOffsets = longOffsets;\n
 const segmentation = toMaskTensor(\n
 tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n
 const partSegmentation =\n
 decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n
 return {\n
 segmentation,\n
 longOffsets:
 scaledLongOffsets,\n
 heatmapScoresRaw: heatmapScores,\n
 offsetsRaw: offsets,\n
 displacementFwdRaw: displacementFwd,\n
 displacementBwdRaw: displacementBwd,\n
 partSegmentation\n
 };\n
 });\n
 const tensorBuffers = await toTensorBuffers3D(\n
 [heatmapScoresRaw,
 offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n
 const [scoresBuf, offsetsBuf,
 displacementsFwdBuf, displacementsBwdBuf] =\n
 tensorBuffers;\n
 let poses = decodeMultiplePoses(\n
 scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
 this.baseModel.outputStride,
 config.maxDetections,\n
 config.scoreThreshold, config.nmsRadius);\n
 poses = scaleAndFlipPoses(\n
 poses, [height, width], internalResolutionHeightAndWidth, padding,\n
 FLIP_POSES_AFTER_SCALING);\n
 const instanceMasks = await decodePersonInstancePartMasks(\n
 segmentation, longOffsets, partSegmentation,
 poses, height, width,\n
 this.baseModel.outputStride, internalResolutionHeightAndWidth, padding,\n
 config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n
 config.maxDetections);\n
 resized.dispose();\n
 segmentation.dispose();\n
 longOffsets.dispose();\n
 heatmapScoresRaw.dispose();\n
 offsetsRaw.dispose();\n
 displacementFwdRaw.dispose();\n
 displacementBwdRaw.dispose();\n
 partSegmentation.dispose();\n
 return instanceMasks;\n
 }\n
 \n
 public dispose() {\n
 this.baseModel.dispose();\n
 }\n
 }\n
 \n
 /**\n
 * Loads the MobileNet BodyPix model.\n
 */\n
 async function loadMobileNet(config: ModelConfig):
 Promise<BodyPix> {\n
 const outputStride = config.outputStride;\n
 const quantBytes = config.quantBytes;\n
 const
 multiplier = config.multiplier;\n
 if (tf == null) {\n
 throw new Error(\n
 `Cannot find TensorFlow.js. If you are
 using a <script> tag, please ` +\n
 `also include @tensorflow/tfjs on the page before using this\n
 model.`);\n
 }\n
 const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n
 const graphModel = await
 tfconv.loadGraphModel(config.modelUrl || url);\n
 const mobilenet = new MobileNet(graphModel, outputStride);\n
 return new BodyPix(mobilenet);\n
 }\n
 \n
 /**\n
 * Loads the ResNet BodyPix model.\n
 */\n
 async function
 loadResNet(config: ModelConfig): Promise<BodyPix> {\n
 const outputStride = config.outputStride;\n
 const
 quantBytes = config.quantBytes;\n
 if (tf == null) {\n
 throw new Error(\n
 `Cannot find TensorFlow.js. If you
 are using a <script> tag, please ` +\n
 `also include @tensorflow/tfjs on the page before using this\n
 model.`);\n
 }\n
 const url = resNet50SavedModel(outputStride, quantBytes);\n
 const graphModel = await
 tfconv.loadGraphModel(config.modelUrl || url);\n
 const resnet = new ResNet(graphModel, outputStride);\n
 return
 new BodyPix(resnet);\n
 }\n
 \n
 /**\n
 * Loads the BodyPix model instance from a checkpoint, with the ResNet\n
 * or

```

MobileNet architecture. The model to be loaded is configurable using the `ModelConfig` dictionary. Please find more details in the `ModelConfig` documentation of the `ModelConfig` dictionary that contains parameters for the BodyPix loading process. Please find more details of each parameters in the documentation of the `ModelConfig` interface. The predefined `MOBILENET_V1_CONFIG` and `RESNET_CONFIG` can also be used as references for defining your customized config.

```

@nexport async
function load(config: ModelConfig = MOBILENET_V1_CONFIG): Promise<BodyPix> {
 config = validateModelConfig(config);
 if (config.architecture === 'ResNet50') {
 return loadResNet(config);
 } else if (config.architecture === 'MobileNetV1') {
 return loadMobileNet(config);
 } else {
 return null;
 }
}

```

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```

=====
/*
// method copied from bGluR in https://codepen.io/zhaojun/pen/zZmRQe
export function cpuBlur(
 canvas: HTMLCanvasElement|OffscreenCanvas,
 image: HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,
 blur: number) {
 const ctx = canvas.getContext('2d');
 let sum = 0;
 const delta = 5;
 const alphaLeft = 1 / (2 * Math.PI * delta * delta);
 const step = blur < 3 ? 1 : 2;
 for (let y = -blur; y <= blur; y += step) {
 for (let x = -blur; x <= blur; x += step) {
 const weight = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));
 sum += weight;
 }
 }
 for (let y = -blur; y <= blur; y += step) {
 for (let x = -blur; x <= blur; x += step) {
 ctx.globalAlpha = alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;
 ctx.drawImage(image, x, y);
 }
 }
 ctx.globalAlpha = 1;
}

```

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```

=====
import {cpuBlur} from './blur';
import {Color, PartSegmentation, PersonSegmentation} from './types';
import {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';
import {getInputSize} from './util';
export type Canvas = HTMLCanvasElement | OffscreenCanvas;
const offScreenCanvases: {[name: string]: Canvas} = {};
type ImageType = HTMLImageElement|HTMLVideoElement|Canvas;
type HasDimensions = {width: number, height: number};
function isSafari() {
 return (/^(?!chrome|android).*safari/i.test(navigator.userAgent));
}
function assertSameDimensions({width: widthA, height: heightA}: HasDimensions, {width: widthB, height: heightB}: HasDimensions, nameA: string, nameB: string) {
 if (widthA !== widthB || heightA !== heightB) {
 throw new Error(`error: dimensions must match. ${nameA} has dimensions ${widthA}x${heightA}, ${nameB} has dimensions ${widthB}x${heightB}`);
 }
}
function flipCanvasHorizontal(canvas: Canvas) {
 const ctx = canvas.getContext('2d');
 ctx.scale(-1, 1);
 ctx.translate(-canvas.width, 0);
}
function drawWithCompositing(ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D, image: Canvas|ImageType, compositeOperation: string) {
 ctx.globalCompositeOperation = compositeOperation;
 ctx.drawImage(image, 0, 0);
}
function createOffScreenCanvas(): Canvas {
 if (typeof document !== 'undefined') {
 return document.createElement('canvas');
 } else if (typeof OffscreenCanvas !== 'undefined') {
 return new OffscreenCanvas(0, 0);
 } else {
 throw new Error('Cannot create a canvas in this context');
 }
}
function ensureOffscreenCanvasCreated(id: string): Canvas {
 if (!offScreenCanvases[id]) {

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offScreenCanvases[id] = createOffScreenCanvas();\n } return offScreenCanvases[id];\n}\n\nfunction
drawAndBlurImageOnCanvas(\n image: ImageType, blurAmount: number, canvas: Canvas) {\n const {height,
width} = image;\n const ctx = canvas.getContext('2d');\n canvas.width = width;\n canvas.height = height;\n
ctx.clearRect(0, 0, width, height);\n ctx.save();\n if (isSafari()) {\n cpuBlur(canvas, image, blurAmount);\n } else
{\n // tslint:disable:no-any\n (ctx as any).filter = `blur(${blurAmount}px)`;\n ctx.drawImage(image, 0, 0,
width, height);\n }\n ctx.restore();\n}\n\nfunction drawAndBlurImageOnOffScreenCanvas(\n image: ImageType,
blurAmount: number,\n offscreenCanvasName: string): Canvas {\n const canvas =
ensureOffscreenCanvasCreated(offscreenCanvasName);\n if (blurAmount === 0) {\n
renderImageToCanvas(image, canvas);\n } else {\n drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n
}\n return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n const {width,
height} = image;\n canvas.width = width;\n canvas.height = height;\n const ctx = canvas.getContext('2d');\n
ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction
renderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n canvas.width = image.width;\n canvas.height
= image.height;\n const ctx = canvas.getContext('2d');\n ctx.putImageData(image, 0, 0);\n}\n\nfunction
renderImageDataToOffScreenCanvas(\n image: ImageData, canvasName: string): Canvas {\n const canvas =
ensureOffscreenCanvasCreated(canvasName);\n renderImageDataToCanvas(image, canvas);\n return
canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with
foreground and background color at each pixel determined by the\n * corresponding binary segmentation value at
the pixel from the output. In\n * other words, pixels where there is a person will be colored with foreground\n *
color and where there is not a person will be colored with background color.\n */\n * @param
personOrPartSegmentation The output from\n * `segmentPerson`, `segmentMultiPerson`,\n * `segmentPersonParts`
or `segmentMultiPersonParts`. They can\n * be SemanticPersonSegmentation object, an array of
PersonSegmentation object,\n * SemanticPartSegmentation object, or an array of PartSegmentation object.\n */\n *
@param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground color\n * (r,g,b,a) for visualizing pixels that
belong to people.\n */\n * @param background Default to {r:0, g:0, b:0, a: 255}. The background color\n * (r,g,b,a)
for visualizing pixels that don't belong to people.\n */\n * @param drawContour Default to false. Whether to draw
the contour around each\n * person's segmentation mask or body part mask.\n */\n * @param foregroundIds Default
to [1]. The integer values that represent\n * foreground. For person segmentation, 1 is the foreground. For body
part\n * segmentation, it can be a subset of all body parts ids.\n */\n * @returns An ImageData with the same width
and height of\n * all the PersonSegmentation in multiPersonSegmentation, with opacity and\n * transparency at each
pixel determined by the corresponding binary\n * segmentation value at the pixel from the output.\n */\nexport
function toMask(\n personOrPartSegmentation: SemanticPersonSegmentation|\n
SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n foreground: Color = {\n r: 0,\n g:
0,\n b: 0,\n a: 0\n },\n background: Color = {\n r: 0,\n g: 0,\n b: 0,\n a: 255\n },\n
drawContour = false, foregroundIds: number[] = [1]): ImageData {\n if (Array.isArray(personOrPartSegmentation)
&&\n personOrPartSegmentation.length === 0) {\n return null;\n }\n let multiPersonOrPartSegmentation:\n
Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n
PersonSegmentation|PartSegmentation>;\n if (!Array.isArray(personOrPartSegmentation)) {\n
multiPersonOrPartSegmentation = [personOrPartSegmentation];\n } else {\n multiPersonOrPartSegmentation =
personOrPartSegmentation;\n }\n const {width, height} = multiPersonOrPartSegmentation[0];\n const bytes =
new Uint8ClampedArray(width * height * 4);\n function drawStroke(\n bytes: Uint8ClampedArray, row:
number, column: number, width: number,\n radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n
for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++) {\n if (i !== 0 && j !== 0) {\n
const n = (row + i) * width + (column + j);\n bytes[4 * n + 0] = color.r;\n bytes[4 * n + 1] = color.g;\n
bytes[4 * n + 2] = color.b;\n bytes[4 * n + 3] = color.a;\n }\n }\n}\n }\n}\n function
isSegmentationBoundary(\n segmentationData: Uint8Array|Int32Array,\n row: number,\n column:
number,\n width: number,\n foregroundIds: number[] = [1],\n radius = 1,\n): boolean {\n let
numberBackgroundPixels = 0;\n for (let i = -radius; i <= radius; i++) {\n for (let j = -radius; j <= radius; j++)

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{\n if (i !== 0 && j !== 0) {\n const n = (row + i) * width + (column + j);\n if
(!foregroundIds.some(id => id === segmentationData[n])) {\n numberBackgroundPixels += 1;\n }\n
}\n }\n return numberBackgroundPixels > 0;\n }\n\n for (let i = 0; i < height; i += 1) {\n for (let j = 0; j
< width; j += 1) {\n const n = i * width + j;\n bytes[4 * n + 0] = background.r;\n bytes[4 * n + 1] =
background.g;\n bytes[4 * n + 2] = background.b;\n bytes[4 * n + 3] = background.a;\n for (let k = 0; k <
multiPersonOrPartSegmentation.length; k++) {\n if (foregroundIds.some(\n id => id ===
multiPersonOrPartSegmentation[k].data[n])) {\n bytes[4 * n] = foreground.r;\n bytes[4 * n + 1] =
foreground.g;\n bytes[4 * n + 2] = foreground.b;\n bytes[4 * n + 3] = foreground.a;\n const
isBoundary = isSegmentationBoundary(\n multiPersonOrPartSegmentation[k].data, i, j, width,\n foregroundIds);\n if (drawContour && i - 1 >= 0 && i + 1 < height && j - 1 >= 0 &&\n j + 1 < width
&& isBoundary) {\n drawStroke(bytes, i, j, width, 1);\n }\n }\n }\n }\n}\n\n return new
ImageData(bytes, width, height);\n}\n\nconst RAINBOW_PART_COLORS: Array<[number, number, number]> =
[\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99],
[255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87], [96, 247, 96],
[64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\n/**\n * Given the output from person body part segmentation (or
multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image
with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param
partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a
SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param partColors A
multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n *
@return An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation,
with the corresponding color for each part at\n * each pixel, and black pixels where there is no part.\n */\n\nexport
function toColoredPartMask(\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n partColors:
Array<[number, number, number]> =\n RAINBOW_PART_COLORS): ImageData {\n if
(Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n return null;\n }\n\n let
multiPersonPartSegmentation;\n if (!Array.isArray(partSegmentation)) {\n multiPersonPartSegmentation =
[partSegmentation];\n } else {\n multiPersonPartSegmentation = partSegmentation;\n }\n\n const {width, height}
= multiPersonPartSegmentation[0];\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0;
i < height * width; ++i) {\n // invert mask. Invert the segmentation mask.\n const j = i * 4;\n bytes[j + 0] =
255;\n bytes[j + 1] = 255;\n bytes[j + 2] = 255;\n bytes[j + 3] = 255;\n\n for (let k = 0; k <
multiPersonPartSegmentation.length; k++) {\n const partId = multiPersonPartSegmentation[k].data[i];\n if
(partId !== -1) {\n const color = partColors[partId];\n if (!color) {\n throw new Error(`No color could
be found for part id ${partId}`);\n }\n bytes[j + 0] = color[0];\n bytes[j + 1] = color[1];\n bytes[j +
2] = color[2];\n bytes[j + 3] = 255;\n }\n }\n return new ImageData(bytes, width, height);\n }\n\n const
CANVAS_NAMES = {\n blurred: 'blurred',\n blurredMask: 'blurred-mask',\n mask: 'mask',\n lowresPartMask:
'lowres-part-mask'\n };\n\n /**\n * Given an image and a maskImage of type ImageData, draws the image with the\n
* mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The
original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this
should be\n * generated by toMask or toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask
when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param
maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n *\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n */\n\n export function
drawMask(\n canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n maskOpacity = 0.7,\n maskBlurAmount = 0, flipHorizontal = false) {\n const [height, width] = getInputSize(image);\n canvas.width =
width;\n canvas.height = height;\n\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n\n ctx.drawImage(image, 0, 0);\n\n ctx.globalAlpha = maskOpacity;\n if
(maskImage) {\n assertSameDimensions({ width, height }, maskImage, 'image', 'mask');\n\n const mask =

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renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n\n const blurredMask =
drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n
ctx.drawImage(blurredMask, 0, 0, width, height);\n }\n ctx.restore();\n}\n\n/**\n * Given an image and a
maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by
toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n *
image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param maskBlurAmount How many pixels to
blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the
result should be flipped horizontally. Defaults\n * to false.\n *\n * @param pixelCellWidth The width of each pixel
cell. Default to 10 px.\n */\nexport function drawPixelatedMask(\n canvas: Canvas, image: ImageType,
maskImage: ImageData,\n maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n pixelCellWidth =
10.0) {\n const [height, width] = getInputSize(image);\n assertSameDimensions({ width, height }, maskImage,
'image', 'mask');\n\n const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n
const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount,
CANVAS_NAMES.blurredMask);\n\n canvas.width = blurredMask.width;\n canvas.height =
blurredMask.height;\n\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n
flipCanvasHorizontal(canvas);\n }\n\n const offscreenCanvas =\n ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n const offscreenCanvasCtx =
offscreenCanvas.getContext('2d');\n offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n
offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n offscreenCanvasCtx.drawImage(\n
blurredMask, 0, 0, blurredMask.width, blurredMask.height, 0, 0,\n offscreenCanvas.width,
offscreenCanvas.height);\n ctx.imageSmoothingEnabled = false;\n ctx.drawImage(\n offscreenCanvas, 0, 0,
offscreenCanvas.width, offscreenCanvas.height, 0,\n 0, canvas.width, canvas.height);\n\n // Draws vertical grid
lines that are `pixelCellWidth` apart from each other.\n for (let i = 0; i < offscreenCanvas.width; i++) {\n
ctx.beginPath();\n ctx.strokeStyle = '#ffffff';\n ctx.moveTo(pixelCellWidth * i, 0);\n ctx.lineTo(pixelCellWidth
* i, canvas.height);\n ctx.stroke();\n }\n\n // Draws horizontal grid lines that are `pixelCellWidth` apart from
each\n // other.\n for (let i = 0; i < offscreenCanvas.height; i++) {\n ctx.beginPath();\n ctx.strokeStyle =
'#ffffff';\n ctx.moveTo(0, pixelCellWidth * i);\n ctx.lineTo(canvas.width, pixelCellWidth * i);\n ctx.stroke();\n
}\n\n ctx.globalAlpha = 1.0 - maskOpacity;\n ctx.drawImage(image, 0, 0, blurredMask.width,
blurredMask.height);\n ctx.restore();\n}\n\nfunction createPersonMask(\n multiPersonSegmentation:
PersonSegmentation[]|SemanticPersonSegmentation,\n edgeBlurAmount: number): Canvas {\n const
backgroundMaskImage = toMask(\n multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},\n {r: 0, g: 0, b: 0, a:
0});\n\n const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred
image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param
personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n *\n * @param
backgroundBlurAmount How many pixels in the background blend into each\n * other. Defaults to 3. Should be an
integer between 1 and 20.\n *\n * @param edgeBlurAmount How many pixels to blur on the edge between the
person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param
flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n */\nexport function
drawBokehEffect(\n canvas: Canvas, image: ImageType,\n multiPersonSegmentation:
SemanticPersonSegmentation|PersonSegmentation[],\n backgroundBlurAmount = 3, edgeBlurAmount = 3,
flipHorizontal = false) {\n const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n image,
backgroundBlurAmount, CANVAS_NAMES.blurred);\n canvas.width = blurredImage.width;\n canvas.height =

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blurredImage.height;\n\n const ctx = canvas.getContext('2d');\n\n if (Array.isArray(multiPersonSegmentation)
&&\n multiPersonSegmentation.length === 0) {\n ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if
(flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const
[height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n //\"destination-in\" - \"The
existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else
is made\n // transparent.\" \n // crop what's not the person using the mask from the original image\n
drawWithCompositing(ctx, personMask, 'destination-in');\n //\"destination-over\" - \"The existing canvas content is
kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\" \n // draw the blurred background on top of the original image where it doesn't\n // overlap.\n
drawWithCompositing(ctx, blurredImage, 'destination-over');\n ctx.restore();\n}\n\nfunction
createBodyPartMask(\n multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n
bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n const backgroundMaskImage = toMask(\n
 multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n
const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return
drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image
with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred
image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param
partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation object.\n *\n * @param
bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be
one of the 24 body part ids.\n *\n * @param backgroundBlurAmount How many pixels in the background blend into
each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n *\n * @param edgeBlurAmount How many
pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer
between 0 and 20.\n *\n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to
false.\n */\nexport function blurBodyPart(\n canvas: Canvas, image: ImageType,\n partSegmentation:
SemanticPartSegmentation|PartSegmentation[],\n bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3,
edgeBlurAmount = 3,\n flipHorizontal = false) {\n const blurredImage =
drawAndBlurImageOnOffScreenCanvas(\n image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n
canvas.width = blurredImage.width;\n canvas.height = blurredImage.height;\n\n const ctx =
canvas.getContext('2d');\n\n if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n
ctx.drawImage(blurredImage, 0, 0);\n return;\n }\n\n const bodyPartMask =\n createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);\n\n ctx.save();\n if (flipHorizontal)
{\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const [height, width] =
getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n //\"destination-in\" - \"The existing canvas
content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n //
transparent.\" \n // crop what's not the person using the mask from the original image\n drawWithCompositing(ctx,
bodyPartMask, 'destination-in');\n //\"destination-over\" - \"The existing canvas content is kept where both the\n
// new shape and existing canvas content overlap. Everything else is made\n // transparent.\" \n // draw the blurred
background on top of the original image where it doesn't\n // overlap.\n drawWithCompositing(ctx, blurredImage,
'destination-over');\n ctx.restore();\n}\n\n\", \"*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n
*\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *

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=====\n\n*/\n\nexport const PART_CHANNELS: string[] = [\n 'left_face',\n 'right_face',\n 'left_upper_arm_front',\n 'left_upper_arm_back',\n 'right_upper_arm_front',\n 'right_upper_arm_back',\n 'left_lower_arm_front',\n 'left_lower_arm_back',\n 'right_lower_arm_front',\n 'right_lower_arm_back',\n 'left_hand',\n 'right_hand',\n 'torso_front',\n 'torso_back',\n 'left_upper_leg_front',\n 'left_upper_leg_back',\n 'right_upper_leg_front',\n 'right_upper_leg_back',\n 'left_lower_leg_front',\n 'left_lower_leg_back',\n 'right_lower_leg_front',\n 'right_lower_leg_back',\n 'left_feet',\n 'right_feet'\n];\n\n/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\n\nconst version = '2.2.0';\nexport { version };
\n\n/** @license\n * Copyright 2019 Google Inc. All Rights Reserved.
\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");
\n * you may not use this file except in compliance with the License.
\n * You may obtain a copy of the License at
\n * https://www.apache.org/licenses/LICENSE-2.0
\n * Unless required by applicable law or agreed to in writing, software
\n * distributed under the License is distributed on an \"AS IS\" BASIS,
\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
\n * See the License for the specific language governing permissions and
\n * limitations under the License.*/\n\n=====\n\n*/\n\nexport { BodyPix, load } from './body_pix_model';
\nexport { blurBodyPart, drawBokehEffect, drawMask, drawPixelatedMask, toColoredPartMask, toMask } from './output_rendering_util';
\nexport { PART_CHANNELS } from './part_channels';
\nexport { PartSegmentation, PersonSegmentation, SemanticPartSegmentation, SemanticPersonSegmentation } from './types';
\nexport { flipPoseHorizontal, resizeAndPadTo, scaleAndCropToInputTensorShape } from './util';
\nexport { version } from './version';
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AAM,iBAAiB,GAAG,UAAC,IAAU;YACjC,OAAA,wBAAwB,CAAC,IAAI,EAAE,CAAC,IAAI,EAAE,IAAI,CAAC,EAAE,CAAC,MAAM,EAAE,MAAM,CAAC,EAAE,MAAM,CAAC;SAAA,CAAC;QAE3E,KAAK,IAAI,cAAc,GAAG,CAAC,EAAE,cAAc,GAAG,iBAAiB,EAC1D,cAAc,EAAE,EAAE;YACrB,IAAM,SAAS,GAAG,YAA Y,CAC1B,QAAQ,EAAE,cAAc,EAAE,iBAAiB,EAAE,iBAAiB,EAC9D,WAAW,EAAE,WAAW,EAAE,CAAC,MAAM,EAAE,KAAK,CAAC,CAAC,CAAC;YAE/C,KAAK,CAAC,IAAI,CAAC,SAAS,CAAC,CAAC;SACvB;QAE D,IAAI,IAAI,GAAG,CAAC,CAAC,CAAC;QACd,IAAI,QAAQ,GAAG,QAAQ,CAAC;QACxB,KAAK,IAAI,CAA C,GAAG,CAAC,EAAE,CAAC,GAAG,KAAK,CAAC,MAAM,EAAE,CAAC,EAAE,EAAE;YACrC,IAAM,IAAI,GAAG,eAAe,CAAC,KAAK,EAAE,KAAK,CAAC,CAAC,CAAC,CAAC;YAC9C,IAAI,IAAI,GAAG,QAA Q,EAAE;gBACnB,IAAI,GAAG,CAAC,CAAC;gBACT,QAAQ,GAAG,IAAI,CAAC;aACjB;SACF;QACD,OAAO,IAAI,CAAC;IACd,CAAC;IAED,SAAS,mBAAmB,CACxB,EAA sD,EACtD,MAAc;YADb,gBAAgB,QAAA,EAA E,gBAAgB,QAAA;QAErC,IAAM,iBAAiB,GAAG,IAAI,CAAC,KAAK,CAAC,CAAC,gBAAgB,GAAG,GAAG,IAAI,MAAM,GAAG,GAAG,CAAC,CAAC;QAC9E,IAAM,iBAAiB,GAAG,IAAI,CAAC,KAAK,CAAC,CAAC,gBAAgB,GAAG,GAAG,IAAI,MAAM,GAAG,GAAG,CAAC,CAAC;QAC9E,OAAO,CAAC,iBAAiB,EAAE,iBAAi B,CAAC,CAAC;IACnD,CAAC;AAED,aAAgB,sBAAsB,CACIC,YAAwB,EAAE,WAAyB,EACnD,eAAuB,EAAE ,MAAc,EAAE,KAAa,EAAE,MAAc,EACtE,EAAqC,EAAE,OAAgB,EACvD,WAAmB,EAAE,iBAAiB;YADzC,QAAQ,QAAA,EAAE,OAAO,QAAA;QACG,kCAAA,EAAA,qBAAqB;QAC5C,IAAM,UAAU,GACZ,eAAe,CAAC,GAAG,CAAC,UAAA,CAAC,IAAI,OAAA,IAAI,UAAU,CAAC,MAAM,GAAG,KAAK,CAAC,CAAC,IAAI,CAA C,CAAC,CAAC,GAAA,CAAC,CAAC;QAE9D,IAAK,IAAI,GAAGB,OAAO,IAAvB,EAAQ,IAAI,GAAI,OAAO,KAA X,CAAY;QAEIC,IAAA,KACF,QAAQ,CAAC,CAAC,MAAM,EAAE,KAAK,CAAC,EAAE,CAAC,QAAQ,EA AE,OAAO,CAAC,EAAE,OAAO,CAAC,EADpD,MAAM,QAAA,EAAE,MAAM,QACsC,CAAC;QACrD,IAAA,iBAAiB,GACtB,mBAAmB,CAAC,CAAC,QAAQ,EAAE,OAAO,CAAC,EAAE,MAAM,CAAC,GAD1B,CAC2B;QACnD,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,MAAM,EAAE,CAAC,IAAI,CAAC,EAAE;YACI C,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,KAAK,EAAE,CAAC,IAAI,CAAC,EAAE;gBACjC,IAAM,CAAC,GAAG,CAAC,GAAG,KAAK,GAAG,CAAC,CAAC;gBACxB,IAAM,IAAI,GAAG,YAA Y,CAAC,C AAC,CAAC,CAAC;gBAC7B,IAAI,IAAI,KAAK,CAAC,EAAE;oBACd,IAAM,IAAI,GAAG,wBAAwB,CACjC,EAAC,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,WAAW,EAAE,eAAe,EAAE,iBAAiB,EAC7D,CAAC,IAAI,EAAE,IAAI,CAAC,EAAE,CAAC,MAAM,EAAE,MAAM,CAAC,EAAE,iBAAiB,EAAE,CAAC,MAAM,EAAE,KAAK,CAAC,EACIE,MAAM,EAAE,WAAW,CAAC,CAAC;oBACzB,IAAI,IAAI,IAAI,CAAC,EAAE;wBACb,UAAU,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC;qBACzB;iBACF;aACF;SACF;QAED,OAAO,UAAU,CAAC;IACpB,CAAC;AAED,aAAgB,0BAA0B,CACtC,YAAwB,EAAE,WAAyB,EACnD,eAA2B,EAAE,eAAuB,EAAE,MAAc,EACpE,KAAa,EAAE,MAAc,EAAE,EAAqC,EACpE,OAAgB,EAAE,WAAmB,EACrC,iBAAiB;YAFW,QAAQ,QAAA,EAAE,OAAO,QAAA;QAEjD,kCAAA,EAAA,qBAAqB;QACvB,IAAM,UAAU,GACZ,eAAe,CAAC,GAAG,CAAC,UAAA,CAAC,IAAI,OAAA,IAAI,UAAU,CAAC,MAAM,GAAG,KAAK,CAAC,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC,GAAA,CAAC,CAAC;QAE/D,IAAK,IAAI,GAAGB,OA AO,IAAvB,EAAQ,IAAI,GAAI,OAAO,KAA X,CAAY;QAEIC,IAAA,KACF,QAAQ,CAAC,CAAC,MAAM,EAAE,KAAK,CAAC,EAAE,CAAC,QAAQ,EA AE,KAAK,CAAC,EAAE,CAAC,QAAQ,EAAE,OAAO,CAAC,EAAE,OAAO,CAAC,EADpD,MAAM,QAAA,EAAE,MAAM,QACsC,CAAC;QACrD,IAAA,iBAAiB,GACtB,mBAAmB,CAAC,CAAC,QAAQ,EAAE,OAAO,CAAC,EAAE,MAAM,CAAC,GAD1B,CAC2B;QAE nD,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,MAAM,EAAE,CAAC,IAAI,CAAC,EAAE;YACIC,KAAK,IAAI,CAAC,GAAG,CAAC,EAAE,CAAC,GAAG,KAAK,EAA E,CAAC,IAAI,CAAC,EAAE;gBACjC,IAAM,CAAC,GAAG,CAAC,GAAG,KAAK,GAAG,CAAC,CAAC;gBACxB,IAAM,IAAI,GAAG,YAA Y,CAAC,CAAC,CAAC,CAAC;gBAC7B,IAAI,IAAI,KAAK,CAAC,EAAE;oBACd,IAAM,IAAI,GAAG,wBAAwB,CACjC,EAAC,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC,EAAE,WAAW,EAAE,eAAe,EAAE,iBAAiB,EAC7D,CAAC,IAAI,EAAE,IAAI,CAAC,EAAE,CAAC,MAAM,EAAE,MAAM,CAAC,EAAE,iBAAiB,EAAE,CAAC,MAAM,EAAE,KAAK,CAAC,EACIE,MAAM,EAAE,WAAW,CAAC,CAA C;oBACzB,IAAI,IAAI,IAAI,CAAC,EAAE;wBACb,UAAU,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC,GAAG,eAAe,CAAC,CAAC,CAAC,CAAC;qBAC1C;iBACF;aACF;SACF;QAED,OAAO,UAAU,CAAC;IACpB,CAAC;;ICxLD;;;;;;;AAiBA,aAOgB,wBAAwB,CACpC,YAAyB,EAAE,WAAwB,EACnD,eAAuB,EAAE,MAAc,EAAE,KAAa,EAAE,MAAc,EACtE,EAAqC,EAAE,OAAgB,EACvD,WAAmB,EAAE,WAAmB,EACxC,YAAoB;YAFnB

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Found in path(s):

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- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/multi\_person/decode\_instance\_masks.js
- \* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/mobilenet.d.ts
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\* /opt/cola/permits/1234600288\_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/dist/body-pix.js

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AM,GA AY,EA AG,EAAA,IA AA,CA AC,WAAA,IA AtB,QAAA,UAAA;;ACDA,aAAA,OAAA,eAAA,QAAA,aAA  
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6B,EA AU,KACvC,EA AY,EA AU,UAAA,wBACIB,MA AA,GAAU,EA AgB,EAAA,iBAAA,EA AQ,SA AU,WAC5  
C,GAA e,EA AgB,EAAA,iBAAA,EA Aa,cAA e,WAC7D,IA AA,EA AmB,KACR,MA AX,IACF,GA AW,EA AgB,EA  
AA,iBAAA,EA AS,UAA W,aAE/B,EAAA,EAAA,mBAAA,EA AQ,MA AO,EA Aa,MA AO,sBA E/C,MA AA,GA AM,  
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readSync(dataId: DataId): BackendValues;\n disposeData(dataId: DataId, force?: boolean): boolean;\n
write(values: BackendValues, shape: number[], dtype: DataType): DataId;\n move(\n dataId: DataId, values:
BackendValues, shape: number[], dtype: DataType,\n refCount: number): void;\n memory(): {unreliable:
boolean}; // Backend-specific information.\n /** Returns number of data ids currently in the storage. */\n
numDataIds(): number;\n refCount(dataId: DataId): number;\n}\n\n/** Convenient class for storing tensor-related
data. */\nexport class DataStorage<T> {\n private data = new WeakMap<DataId, T>();\n private dataIdsCount =
0;\n\n constructor(private backend: KernelBackend, private dataMover: DataMover) {} \n\n get(dataId: DataId) {\n
if (!this.data.has(dataId)) {\n this.dataMover.moveData(this.backend, dataId);\n } \n return
this.data.get(dataId);\n }\n\n set(dataId: DataId, value: T): void {\n this.dataIdsCount++;\n this.data.set(dataId,
value);\n }\n\n has(dataId: DataId): boolean {\n return this.data.has(dataId);\n }\n\n delete(dataId: DataId):
boolean {\n this.dataIdsCount--;\n return this.data.delete(dataId);\n }\n\n numDataIds(): number {\n return
this.dataIdsCount;\n }\n}\n\nexport interface DataMover {\n /**\n * To be called by backends whenever they see
a dataId that they don't own.\n * Upon calling this method, the mover will fetch the tensor from another\n *
backend and register it with the current active backend.\n */\n moveData(backend: KernelBackend, dataId:
DataId): void;\n}\n\nexport interface BackendTimer {\n // check if backend timer is available\n timerAvailable():
boolean;\n time(f: () => void): Promise<BackendTimingInfo>;\n}\n\n/**\n * The interface that defines the kernels
that should be implemented when\n * adding a new backend. New backends don't need to implement every one of
the\n * methods, this can be done gradually (throw an error for unimplemented\n * methods).\n */\nexport class
KernelBackend implements TensorStorage, Backend, BackendTimer {\n refCount(dataId: DataId): number {\n return
notYetImplemented('refCount');\n }\n incRef(dataId: DataId): void {\n return
notYetImplemented('incRef');\n }\n timerAvailable(): boolean {\n return true;\n }\n time(f: () => void):
Promise<BackendTimingInfo> {\n return notYetImplemented('time');\n }\n read(dataId: object):
Promise<BackendValues> {\n return notYetImplemented('read');\n }\n readSync(dataId: object): BackendValues
{\n return notYetImplemented('readSync');\n }\n numDataIds(): number {\n return
notYetImplemented('numDataIds');\n }\n disposeData(dataId: object, force?: boolean): boolean {\n return
notYetImplemented('disposeData');\n }\n write(values: BackendValues, shape: number[], dtype: DataType): DataId
{\n return notYetImplemented('write');\n }\n move(\n dataId: DataId, values: BackendValues, shape:
number[], dtype: DataType,\n refCount: number): void {\n return notYetImplemented('move');\n }\n memory(): {unreliable: boolean; reasons?: string[]} {\n return notYetImplemented('memory');\n }\n /** Returns
the highest precision for floats in bits (e.g. 16 or 32) */\n floatPrecision(): 16|32 {\n return
notYetImplemented('floatPrecision');\n }\n /** Returns the smallest representable number. */\n epsilon(): number
{\n return this.floatPrecision() === 32 ? EPSILON_FLOAT32 : EPSILON_FLOAT16;\n }\n dispose(): void {\n return
notYetImplemented('dispose');\n }\n}\n\nfunction notYetImplemented(kernelName: string): never {\n throw
new Error(\n `${kernelName} not yet implemented or not found in the registry. ` +\n `This kernel may not be
supported by the tfjs backend you have chosen`);\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */\n\n
=====\n\n*/\n\nimport {DataType, DataTypeMap, FlatVector, NumericDataType, RecursiveArray, TensorLike, TypedArray}
from './types';\n\n/**\n * Shuffles the array in-place using Fisher-Yates algorithm.\n */\n * ```\n * const a = [1, 2, 3,
4, 5];\n * tf.util.shuffle(a);\n * console.log(a);\n * ```\n */\n * @param array The array to shuffle in-place.\n */\n *
@doc {heading: 'Util', namespace: 'util'}\n */\n\n// tslint:disable-next-line:no-any\nexport function shuffle(array:
any[]|Uint32Array|Int32Array|Float32Array): void {\n let counter = array.length;\n let temp = 0;\n let index = 0;\n // While there are elements in the array\n while (counter > 0) {\n // Pick a random index\n index

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= (Math.random() * counter) | 0;\n // Decrease counter by 1\n counter--;\n // And swap the last element with
it\n temp = array[counter];\n array[counter] = array[index];\n array[index] = temp;\n }\n}\n\n/**\n * Shuffles
two arrays in-place the same way using Fisher-Yates algorithm.\n *\n * ```js\n * const a = [1,2,3,4,5];\n * const b =
[11,22,33,44,55];\n * tf.util.shuffleCombo(a, b);\n * console.log(a, b);\n * ```\n *\n * @param array The first array
to shuffle in-place.\n * @param array2 The second array to shuffle in-place with the same permutation\n * as the
first array.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\n\n// tslint:disable-next-line:no-any\nexport function
shuffleCombo(array: any[]|Uint32Array|Int32Array|Float32Array,\n// tslint:disable-next-line:no-any\narray2: any[]|Uint32Array|Int32Array|Float32Array): void {\n\n if (array.length !== array2.length) {\n throw
Error(\n `Array sizes must match to be shuffled together` +\n `First array length was ${array.length}` +\n `Second array length was ${array2.length}`);\n }\n let counter = array.length;\n let temp, temp2;\n let index = 0;\n\n // While there are elements in the array\n while (counter > 0) {\n // Pick a random index\n index =
(Math.random() * counter) | 0;\n // Decrease counter by 1\n counter--;\n // And swap the last element of each
array with it\n temp = array[counter];\n temp2 = array2[counter];\n array[counter] = array[index];\n
array2[counter] = array2[index];\n array[index] = temp;\n array2[index] = temp2;\n }\n}\n\n/**\n * Clamps a value
to a specified range. *\n\nexport function clamp(min: number, x: number, max: number): number {\n return
Math.max(min, Math.min(x, max));\n}\n\nexport function nearestLargerEven(val: number): number {\n return val
% 2 === 0 ? val : val + 1;\n}\n\nexport function sum(arr: number[]): number {\n let sum = 0;\n for (let i = 0; i <
arr.length; i++) {\n sum += arr[i];\n }\n return sum;\n}\n\n\n/**\n * Returns a sample from a uniform [a, b)
distribution.\n *\n * @param a The minimum support (inclusive).\n * @param b The maximum support
(exclusive).\n *\n * @return A pseudorandom number on the half-open interval [a,b).\n */\n\nexport function
randUniform(a: number, b: number) {\n const r = Math.random();\n return (b * r) + (1 - r) * a;\n}\n\n\n/**\n * Returns
the squared Euclidean distance between two vectors. *\n\nexport function distSquared(a: FlatVector, b: FlatVector):
number {\n let result = 0;\n for (let i = 0; i < a.length; i++) {\n const diff = Number(a[i]) - Number(b[i]);\n
result += diff * diff;\n }\n return result;\n}\n\n\n/**\n * Asserts that the expression is true. Otherwise throws an error
with the\n * provided message.\n *\n * ```js\n * const x = 2;\n * tf.util.assert(x === 2, 'x is not 2');\n * ```\n *\n *
@param expr The expression to assert (as a boolean).\n * @param msg A function that returns the message to report
when throwing an\n * error. We use a function for performance reasons.\n *\n * @doc {heading: 'Util',
namespace: 'util'}\n */\n\nexport function assert(expr: boolean, msg: () => string) {\n if (!expr) {\n throw new
Error(typeof msg === 'string' ? msg : msg());\n }\n}\n\nexport function assertShapesMatch(\n shapeA: number[],
shapeB: number[], errorMessagePrefix = "): void {\n assert(\n arraysEqual(shapeA, shapeB),\n () =>
errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);\n}\n\nexport function assertNonNull(a:
TensorLike): void {\n assert(\n a != null,\n () => `The input to the tensor constructor must be a non-null
value.`);\n}\n\n\n// NOTE: We explicitly type out what T extends instead of any so that\n// util.flatten on a nested
array of number doesn't try to infer T as a\n// number[][], causing us to explicitly type util.flatten<number>().\n\n/**\n *
Flattens an arbitrarily nested array.\n *\n * ```js\n * const a = [[1, 2], [3, 4], [5, [6, [7]]]];\n * const flat =
tf.util.flatten(a);\n * console.log(flat);\n * ```\n *\n * @param arr The nested array to flatten.\n * @param result
The destination array which holds the elements.\n * @param skipTypedArray If true, avoids flattening the typed
arrays. Defaults\n * to false.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\n\nexport function
flatten<T extends number|boolean|string|Promise<number>|TypedArray>(\n arr: T|RecursiveArray<T>, result: T[] = [],
skipTypedArray = false): T[] {\n if (result == null) {\n result = [];\n }\n if (Array.isArray(arr) ||
isTypedArray(arr) && !skipTypedArray) {\n for (let i = 0; i < arr.length; ++i) {\n flatten(arr[i], result,
skipTypedArray);\n }\n } else {\n result.push(arr as T);\n }\n return result;\n}\n\n\n/**\n * Returns the size
(number of elements) of the tensor given its shape.\n *\n * ```js\n * const shape = [3, 4, 2];\n * const size =
tf.util.sizeFromShape(shape);\n * console.log(size);\n * ```\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\n\nexport function
sizeFromShape(shape: number[]): number {\n if (shape.length === 0) {\n // Scalar.\n return
1;\n }\n let size = shape[0];\n for (let i = 1; i < shape.length; i++) {\n size *= shape[i];\n }\n return
size;\n}\n\nexport function isScalarShape(shape: number[]): boolean {\n return shape.length === 0;\n}\n\nexport
function arraysEqual(n1: FlatVector, n2: FlatVector) {\n if (n1 === n2) {\n return true;\n }\n if (n1 == null || n2

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== null) {\n return false;\n }\n\n if (n1.length !== n2.length) {\n return false;\n }\n for (let i = 0; i < n1.length;
i++) {\n if (n1[i] !== n2[i]) {\n return false;\n }\n }\n return true;\n}\n\nexport function isInt(a: number):
boolean {\n return a % 1 === 0;\n}\n\nexport function tanh(x: number): number {\n // tslint:disable-next-line:no-
any\n if ((Math as any).tanh !== null) {\n // tslint:disable-next-line:no-any\n return (Math as any).tanh(x);\n }\n if (x === Infinity) {\n return 1;\n } else if (x === -Infinity) {\n return -1;\n } else {\n const e2x = Math.exp(2
* x);\n return (e2x - 1) / (e2x + 1);\n }\n}\n\nexport function sizeToSquarishShape(size: number): [number,
number] {\n const width = Math.ceil(Math.sqrt(size));\n return [width, Math.ceil(size / width)];\n}\n\n/**\n *
Creates a new array with randomized indicies to a given quantity.\n * \n * ```\n * const randomTen =
tf.util.createShuffledIndices(10);\n * console.log(randomTen);\n * ```\n * \n * @param number Quantity of how
many shuffled indicies to create.\n * \n * @doc {heading: 'Util', namespace: 'util'}\n * \n * ^\nexport function
createShuffledIndices(n: number): Uint32Array {\n const shuffledIndices = new Uint32Array(n);\n for (let i = 0; i
< n; ++i) {\n shuffledIndices[i] = i;\n }\n shuffle(shuffledIndices);\n return shuffledIndices;\n}\n\nexport
function rightPad(a: string, size: number): string {\n if (size <= a.length) {\n return a;\n }\n return a + '
.repeat(size - a.length);\n}\n\nexport function repeatedTry(\n checkFn: () => boolean, delayFn = (counter:
number) => 0,\n maxCounter?: number): Promise<void> {\n return new Promise<void>((resolve, reject) => {\n
let tryCount = 0;\n\n const tryFn = () => {\n if (checkFn()) {\n resolve();\n return;\n }\n\n
tryCount++;\n\n const nextBackoff = delayFn(tryCount);\n\n if (maxCounter !== null && tryCount >=
maxCounter) {\n reject();\n return;\n }\n setTimeout(tryFn, nextBackoff);\n });\n}\n\n tryFn();\n
});\n}\n\n/**\n * Given the full size of the array and a shape that may contain -1 as the\n * implicit dimension,
returns the inferred shape where -1 is replaced.\n * E.g. For shape=[2, -1, 3] and size=24, it will return [2, 4, 3].\n
*\n * @param shape The shape, which may contain -1 in some dimension.\n * @param size The full size (number of
elements) of the array.\n * @return The inferred shape where -1 is replaced with the inferred size.\n * ^\nexport
function inferFromImplicitShape(\n shape: number[], size: number): number[] {\n let shapeProd = 1;\n let
implicitIdx = -1;\n\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] >= 0) {\n shapeProd *= shape[i];\n }
else if (shape[i] === -1) {\n if (implicitIdx !== -1) {\n throw Error(\n `Shapes can only have 1 implicit
size. ` +\n `Found -1 at dim ${implicitIdx} and dim ${i}`);\n }\n implicitIdx = i;\n } else if (shape[i]
< 0) {\n throw Error(`Shapes can not be < 0. Found ${shape[i]} at dim ${i}`);\n }\n }\n\n if (implicitIdx === -
1) {\n if (size > 0 && size !== shapeProd) {\n throw Error(`Size(${size}) must match the product of shape
${shape}`);\n }\n return shape;\n }\n\n if (shapeProd === 0) {\n throw Error(\n `Cannot infer the missing
size in ${shape} when ` +\n `there are 0 elements`);\n }\n\n if (size % shapeProd !== 0) {\n throw Error(\n
`The implicit shape can't be a fractional number. ` +\n `Got ${size} / ${shapeProd}`);\n }\n\n const newShape
= shape.slice();\n newShape[implicitIdx] = size / shapeProd;\n return newShape;\n}\n\nexport function
parseAxisParam(\n axis: number|number[], shape: number[]): number[] {\n const rank = shape.length;\n\n //
Normalize input\n axis = axis == null ? shape.map((s, i) => i) : [].concat(axis);\n\n // Check for valid range\n
assert(\n axis.every(ax => ax >= -rank && ax < rank),\n () =>\n `All values in axis param must be in
range [-${rank}, ${rank}) but ` +\n `got axis ${axis}`);\n\n // Check for only integers\n assert(\n
axis.every(ax => isInt(ax)),\n () => `All values in axis param must be integers but ` +\n `got axis
${axis}`);\n\n // Handle negative axis.\n return axis.map(a => a < 0 ? rank + a : a);\n}\n\n/** Reduces the shape by
removing all dimensions of shape 1. *\nexport function squeezeShape(shape: number[], axis?: number[]):\n {\n newShape: number[], keptDims: number[]\n } {\n const newShape: number[] = [];\n const keptDims: number[] =
[];\n const isEmptyArray = axis !== null && Array.isArray(axis) && axis.length === 0;\n const axes = (axis == null
|| isEmptyArray) ?\n null :\n parseAxisParam(axis, shape).sort();\n let j = 0;\n for (let i = 0; i < shape.length;
++i) {\n if (axes !== null) {\n if (axes[j] === i && shape[i] !== 1) {\n throw new Error(\n `Can't
squeeze axis ${i} since its dim '${shape[i]}' is not 1`);\n }\n if ((axes[j] == null || axes[j] > i) && shape[i] ===
1) {\n newShape.push(shape[i]);\n keptDims.push(i);\n }\n if (axes[j] <= i) {\n j++;\n }\n
}\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n keptDims.push(i);\n }\n }\n return {newShape,
keptDims};\n}\n\nexport function getTypedArrayFromDType<D extends NumericDataType>(\n dtype: D, size:
number): DataTypeMap[D] {\n let values = null;\n if (dtype == null || dtype === 'float32') {\n values = new

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Float32Array(size);\n } else if (dtype === 'int32') {\n values = new Int32Array(size);\n } else if (dtype ===
'bool') {\n values = new Uint8Array(size);\n } else {\n throw new Error(`Unknown data type ${dtype}`);\n }\n
return values as DataTypeMap[D];\n}\n\nexport function getArrayFromDType<D extends DataType>(\n dtype:
D, size: number): DataTypeMap[D] {\n let values = null;\n if (dtype == null || dtype === 'float32') {\n values =
new Float32Array(size);\n } else if (dtype === 'int32') {\n values = new Int32Array(size);\n } else if (dtype ===
'bool') {\n values = new Uint8Array(size);\n } else if (dtype === 'string') {\n values = new
Array<'string'>(size);\n } else {\n throw new Error(`Unknown data type ${dtype}`);\n }\n return values as
DataTypeMap[D];\n}\n\nexport function checkConversionForErrors<D extends DataType>(\n vals:
DataTypeMap[D]|number[], dtype: D): void {\n for (let i = 0; i < vals.length; i++) {\n const num = vals[i] as
number;\n if (isNaN(num) || !isFinite(num)) {\n throw Error(`A tensor of type ${dtype} being uploaded
contains ${num}.`);\n }\n }\n}\n\n/** Returns true if the dtype is valid. */\nexport function isValidDtype(dtype:
DataType): boolean {\n return dtype === 'bool' || dtype === 'complex64' || dtype === 'float32' ||\n dtype ===
'int32' || dtype === 'string';\n}\n\n/**\n * Returns true if the new type can't encode the old type without loss of\n *
precision.\n */\nexport function hasEncodingLoss(oldType: DataType, newType: DataType): boolean {\n if
(newType === 'complex64') {\n return false;\n }\n if (newType === 'float32' && oldType !== 'complex64') {\n
return false;\n }\n if (newType === 'int32' && oldType !== 'float32' && oldType !== 'complex64') {\n return
false;\n }\n if (newType === 'bool' && oldType === 'bool') {\n return false;\n }\n return true;\n}\n\nexport
function isArray(a: {}): a is Float32Array|Int32Array|Uint8Array {\n return a instanceof Float32Array || a
instanceof Int32Array ||\n a instanceof Uint8Array;\n}\n\nexport function bytesPerElement(dtype: DataType):
number {\n if (dtype === 'float32' || dtype === 'int32') {\n return 4;\n } else if (dtype === 'complex64') {\n
return 8;\n } else if (dtype === 'bool') {\n return 1;\n } else {\n throw new Error(`Unknown dtype ${dtype}`);\n
}\n}\n\n/**\n * Returns the approximate number of bytes allocated in the string array - 2\n * bytes per character.
Computing the exact bytes for a native string in JS is\n * not possible since it depends on the encoding of the html
page that serves\n * the website.\n */\nexport function bytesFromStringArray(arr: Uint8Array[]): number {\n if (arr
=== null) {\n return 0;\n }\n let bytes = 0;\n arr.forEach(x => bytes += x.length);\n return bytes;\n}\n\n/**
Returns true if the value is a string. */\nexport function isString(value: {}): value is string {\n return typeof value
=== 'string' || value instanceof String;\n}\n\nexport function isBoolean(value: {}): boolean {\n return typeof value
=== 'boolean';\n}\n\nexport function isNumber(value: {}): boolean {\n return typeof value ===
'number';\n}\n\nexport function inferDtype(values: TensorLike): DataType {\n if (Array.isArray(values)) {\n
return inferDtype(values[0]);\n }\n if (values instanceof Float32Array) {\n return 'float32';\n } else if (values
instanceof Int32Array || values instanceof Uint8Array) {\n return 'int32';\n } else if (isNumber(values)) {\n
return 'float32';\n } else if (isString(values)) {\n return 'string';\n } else if (isBoolean(values)) {\n return
'bool';\n }\n return 'float32';\n}\n\nexport function isFunction(f: Function) {\n return !!f && f.constructor && f.call &&
f.apply);\n}\n\nexport function nearestDivisor(size: number, start: number): number {\n for (let i = start; i < size;
++i) {\n if (size % i === 0) {\n return i;\n }\n }\n return size;\n}\n\nexport function computeStrides(shape:
number[]): number[] {\n const rank = shape.length;\n if (rank < 2) {\n return [];\n }\n // Last dimension has
implicit stride of 1, thus having D-1 (instead of D)\n // strides.\n const strides = new Array(rank - 1);\n strides[rank
- 2] = shape[rank - 1];\n for (let i = rank - 3; i >= 0; --i) {\n strides[i] = strides[i + 1] * shape[i + 1];\n }\n return
strides;\n}\n\nfunction createNestedArray(offset: number, shape: number[], a: TypedArray) {\n const ret = new
Array();\n if (shape.length === 1) {\n const d = shape[0];\n for (let i = 0; i < d; i++) {\n ret[i] = a[offset +
i];\n }\n } else {\n const d = shape[0];\n const rest = shape.slice(1);\n const len = rest.reduce((acc, c) => acc
* c);\n for (let i = 0; i < d; i++) {\n ret[i] = createNestedArray(offset + i * len, rest, a);\n }\n }\n return
ret;\n}\n\n// Provide a nested array of TypedArray in given shape.\nexport function toNestedArray(shape: number[],
a: TypedArray) {\n if (shape.length === 0) {\n // Scalar type should return a single number.\n return a[0];\n }\n
const size = shape.reduce((acc, c) => acc * c);\n if (size === 0) {\n // A tensor with shape zero should be turned
into empty list.\n return [];\n }\n if (size !== a.length) {\n throw new Error(`[${shape}] does not match the
input size ${a.length}.`);\n }\n return createNestedArray(0, shape, a);\n}\n\nexport function
makeOnesTypedArray<D extends DataType>(\n size: number, dtype: D): DataTypeMap[D] {\n const array =

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makeZerosTypedArray(size, dtype);\n for (let i = 0; i < array.length; i++) {\n array[i] = 1;\n }\n return
array;\n}\n\nexport function makeZerosTypedArray<D extends DataType>(\n size: number, dtype: D):
DataTypeMap[D] {\n if (dtype === null || dtype === 'float32' || dtype === 'complex64') {\n return new
Float32Array(size) as DataTypeMap[D];\n } else if (dtype === 'int32') {\n return new Int32Array(size) as
DataTypeMap[D];\n } else if (dtype === 'bool') {\n return new Uint8Array(size) as DataTypeMap[D];\n } else
{\n throw new Error(`Unknown data type ${dtype}`);\n }\n}\n\n/**\n * Make nested `TypedArray` filled with
zeros.\n * @param shape The shape information for the nested array.\n * @param dtype dtype of the array
element.\n */\nexport function makeZerosNestedTypedArray<D extends DataType>(\n shape: number[], dtype: D)
{\n const size = shape.reduce((prev, curr) => prev * curr, 1);\n if (dtype === null || dtype === 'float32') {\n
return
toNestedArray(shape, new Float32Array(size));\n } else if (dtype === 'int32') {\n return toNestedArray(shape,
new Int32Array(size));\n } else if (dtype === 'bool') {\n return toNestedArray(shape, new Uint8Array(size));\n
 } else {\n throw new Error(`Unknown data type ${dtype}`);\n }\n}\n\nexport function
assertNonNegativeIntegerDimensions(shape: number[]) {\n shape.forEach(dimSize => {\n assert(\n
Number.isInteger(dimSize) && dimSize >= 0,\n () =>\n `Tensor must have a shape comprised of
positive integers but got ` +\n `shape [${shape}].`);\n });\n}\n\n/**\n * Computes flat index for a given
location (multidimensional index) in a\n * Tensor/multidimensional array.\n * @param locs Location in the
tensor.\n * @param rank Rank of the tensor.\n * @param strides Tensor strides.\n */\nexport function locToIndex(\n
 locs: number[], rank: number, strides: number[]): number {\n if (rank === 0) {\n return 0;\n } else if (rank
=== 1) {\n return locs[0];\n }\n let index = locs[locs.length - 1];\n for (let i = 0; i < locs.length - 1;
++i) {\n index
+= strides[i] * locs[i];\n }\n return index;\n}\n\n/**\n * Computes the location (multidimensional index) in a
tensor/multidimensional\n * array for a given flat index.\n * @param index Index in flat array.\n * @param rank
Rank of tensor.\n * @param strides Strides of tensor.\n */\nexport function indexToLoc(\n index: number, rank:
number, strides: number[]): number[] {\n if (rank === 0) {\n return [];\n } else if (rank === 1) {\n return
[index];\n }\n const locs: number[] = new Array(rank);\n for (let i = 0; i < locs.length - 1; ++i) {\n locs[i] =
Math.floor(index / strides[i]);\n index -= locs[i] * strides[i];\n }\n locs[locs.length - 1] = index;\n return
locs;\n}\n\n/**\n * This method asserts whether an object is a Promise instance.\n * @param object\n */\n//
tslint:disable-next-line: no-any\nexport function isPromise(object: any) {\n // We chose to not use 'obj instanceof
Promise' for two reasons:\n // 1. It only reliably works for es6 Promise, not other Promise\n // implementations.\n
// 2. It doesn't work with framework that uses zone.js. zone.js monkey patch\n // the async calls, so it is possible
the obj (patched) is comparing to a\n // pre-patched Promise.\n return object && object.then && typeof
object.then === 'function';\n}\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\\n
*\n\nimport {Platform} from './platforms/platform';\nimport {isPromise} from './util_base';\n\n// Expects flags from
URL in the format ?tfjsflags=FLAG1:1,FLAG2:true.\nconst TENSORFLOWJS_FLAGS_PREFIX =
'tfjsflags';\n\ntype FlagValue = number|boolean;\ntype FlagEvaluationFn = (() => FlagValue)|((() =>
Promise<FlagValue>));\nexport type Flags = {\n [featureName: string]: FlagValue\n};\nexport type
FlagRegistryEntry = {\n evaluationFn: FlagEvaluationFn;\n setHook?: (value: FlagValue) => void;\n};\n\n/**\n * The
environment contains evaluated flags as well as the registered platform.\n * This is always used as a global
singleton and can be retrieved with\n * `tf.env`.\n */\n * @doc {heading: 'Environment'}\n */\nexport class
Environment {\n private flags: Flags = {};\n private flagRegistry: {[flagName: string]: FlagRegistryEntry} =
{};\n private urlFlags: Flags = {};\n platformName: string;\n platform: Platform;\n\n // tslint:disable-next-line:
no-any\n constructor(public global: any) {\n this.populateURLFlags();\n }\n\n setPlatform(platformName:

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string, platform: Platform) {\n if (this.platform !== null) {\n console.warn(\n `Platform
${this.platformName} has already been set. ` +\n `Overwriting the platform with ${platform}.`);\n }\n this.platformName = platformName;\n this.platform = platform;\n }\n\n registerFlag(\n flagName: string,
evaluationFn: FlagEvaluationFn,\n setHook?: (value: FlagValue) => void) {\n this.flagRegistry[flagName] =
{evaluationFn, setHook};\n\n // Override the flag value from the URL. This has to happen here because the\n // environment is initialized before flags get registered.\n if (this.urlFlags[flagName] !== null) {\n const flagValue
= this.urlFlags[flagName];\n console.warn(\n `Setting feature override from URL ${flagName}:
${flagValue}.`);\n this.set(flagName, flagValue);\n }\n }\n\n async getAsync(flagName: string):
Promise<FlagValue> {\n if (flagName in this.flags) {\n return this.flags[flagName];\n }\n\n this.flags[flagName] = await this.evaluateFlag(flagName);\n return this.flags[flagName];\n }\n\n get(flagName:
string): FlagValue {\n if (flagName in this.flags) {\n return this.flags[flagName];\n }\n\n const flagValue =
this.evaluateFlag(flagName);\n if (isPromise(flagValue)) {\n throw new Error(\n `Flag ${flagName}
cannot be synchronously evaluated. ` +\n `Please use getAsync() instead.`);\n }\n\n this.flags[flagName] =
flagValue as number | boolean;\n\n return this.flags[flagName];\n }\n\n getNumber(flagName: string): number
{\n return this.get(flagName) as number;\n }\n\n getBool(flagName: string): boolean {\n return
this.get(flagName) as boolean;\n }\n\n getFlags(): Flags {\n return this.flags;\n }\n\n // For backwards
compatibility.\n get features(): Flags {\n return this.flags;\n }\n\n set(flagName: string, value: FlagValue): void
{\n if (this.flagRegistry[flagName] === null) {\n throw new Error(\n `Cannot set flag ${flagName} as it
has not been registered.`);\n }\n this.flags[flagName] = value;\n if (this.flagRegistry[flagName].setHook !==
null) {\n this.flagRegistry[flagName].setHook(value);\n }\n }\n\n private evaluateFlag(flagName: string):
FlagValue|Promise<FlagValue> {\n if (this.flagRegistry[flagName] === null) {\n throw new Error(\n
`Cannot evaluate flag '${flagName}': no evaluation function found.`);\n }\n return
this.flagRegistry[flagName].evaluationFn();\n }\n\n setFlags(flags: Flags) {\n this.flags = Object.assign({},
flags);\n }\n\n reset() {\n this.flags = {};\n this.urlFlags = {};\n this.populateURLFlags();\n }\n\n private
populateURLFlags(): void {\n if (typeof this.global === 'undefined' ||\n typeof this.global.location ===
'undefined' ||\n typeof this.global.location.search === 'undefined') {\n return;\n }\n\n const urlParams =
getQueryParams(this.global.location.search);\n if (TENSORFLOWJS_FLAGS_PREFIX in urlParams) {\n
const keyValues = urlParams[TENSORFLOWJS_FLAGS_PREFIX].split(',');\n keyValues.forEach(keyValue =>
{\n const [key, value] = keyValue.split(':') as [string, string];\n this.urlFlags[key] = parseValue(key,
value);\n });\n }\n }\n\n\nexport function getQueryParams(queryString: string): {[key: string]: string} {\n
const params = {};\n queryString.replace(/(?:&)([^\s=&?]+)(?:=([^\s&]*)?)?/g, (s, ...t) => {\n
decodeParam(params,
t[0], t[1]);\n return t.join('=');\n });\n return params;\n }\n\n\nfunction decodeParam(\n params: {[key: string]:
string},\n name: string,\n value?: string) {\n params[decodeURIComponent(name)] = decodeURIComponent(value ||
'');\n }\n\nfunction parseValue(flagName: string, value: string): FlagValue {\n value = value.toLowerCase();\n if
(value === 'true' || value === 'false') {\n return value === 'true';\n } else if (`${+value}` === value) {\n
return
+value;\n }\n throw new Error(\n `Could not parse value flag value ${value} for flag
${flagName}.`);\n }\n\n\n/**\n * Returns the current environment (a global singleton).\n *\n * The environment object
contains the evaluated feature values as well as the\n * active platform.\n *\n * @doc {heading: 'Environment'}\n *\n\nexport function env() {\n return ENV;\n }\n\n\nexport let ENV: Environment = null;\n\nexport function
setEnvironmentGlobal(environment: Environment) {\n ENV = environment;\n }\n\n", // shim for using process in
browser\n\nvar process = module.exports = {};\n\n// cached from whatever global is present so that test runners that
stub it\n// don't break things. But we need to wrap it in a try catch in case it is\n// wrapped in strict mode code which
doesn't define any globals. It's inside a\n// function because try/catches deoptimize in certain engines.\n\n\nvar
cachedSetTimeout;\n\nvar cachedClearTimeout;\n\n\nfunction defaultSetTimeout() {\n throw new Error('setTimeout
has not been defined');\n }\n\nfunction defaultClearTimeout () {\n throw new Error('clearTimeout has not been
defined');\n }\n\n(function () {\n try {\n if (typeof setTimeout === 'function') {\n cachedSetTimeout =
setTimeout;\n } else {\n cachedSetTimeout = defaultSetTimeout;\n }\n } catch (e) {\n
cachedSetTimeout = defaultSetTimeout;\n }\n try {\n if (typeof clearTimeout === 'function') {\n

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global object regardless of how the module is\n// resolved.\n// tslint:disable-next-line:no-any\nlet globalNameSpace:
{ _tfGlobals: Map<string, any> }; \n// tslint:disable-next-line:no-any\nexport function getGlobalNamespace():
{ _tfGlobals: Map<string, any> } {\n if (globalNameSpace == null) {\n // tslint:disable-next-line:no-any\n let ns:
any;\n if (typeof (window) !== 'undefined') {\n ns = window;\n } else if (typeof (global) !== 'undefined') {\n
ns = global;\n } else if (typeof (process) !== 'undefined') {\n ns = process;\n } else if (typeof (self) !==
'undefined') {\n ns = self;\n } else {\n throw new Error('Could not find a global object');\n }\n
globalNameSpace = ns;\n }\n return globalNameSpace;\n}\n\n// tslint:disable-next-line:no-any\nfunction
getGlobalMap(): Map<string, any> {\n const ns = getGlobalNamespace();\n if (ns._tfGlobals == null) {\n
ns._tfGlobals = new Map();\n }\n return ns._tfGlobals;\n}\n\n/**\n * Returns a globally accessible 'singleton'
object.\n * \n * @param key the name of the object\n * @param init a function to initialize to initialize this object\n *
the first time it is fetched.\n */\nexport function getGlobal<T>(key: string, init: () => T): T {\n const
globalMap = getGlobalMap();\n if (globalMap.has(key)) {\n return globalMap.get(key);\n } else {\n const
singleton = init();\n globalMap.set(key, singleton);\n return globalMap.get(key);\n }\n}\n\n", "/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
'License');\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS' BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */
=====\n *\n//
Allow UpperCamelCase variable names\n// tslint:disable: variable-name\n// Unfortunately just enabling PascalCase
per file (tslint:enable:\n// allow-pascal-case) doesn't work.\nimport {NamedTensorInfoMap, TensorInfo} from
'./kernel_registry';\nimport {ExplicitPadding} from './ops/conv_util';\nimport {Activation} from
'./ops/fused_types';\nimport {DataType, PixelData} from './types';\n\nexport const Abs = 'Abs';\nexport type
AbsInputs = UnaryInputs;\n\nexport const Acos = 'Acos';\nexport type AcosInputs = UnaryInputs;\n\nexport const
Acosh = 'Acosh';\nexport type AcoshInputs = UnaryInputs;\n\nexport const Add = 'Add';\nexport type AddInputs =
BinaryInputs;\n\nexport const AddN = 'AddN';\nexport type AddNInputs = TensorInfo[];\n\nexport const All =
'All';\nexport type AllInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface AllAttrs {\n axis:
number|number[];\n keepDims: boolean;\n}\n\nexport const Any = 'Any';\nexport type AnyInputs =
Pick<NamedTensorInfoMap, 'x'>;\nexport interface AnyAttrs {\n axis: number|number[];\n keepDims:
boolean;\n}\n\nexport const ArgMax = 'ArgMax';\nexport type ArgMaxInputs = Pick<NamedTensorInfoMap,
'x'>;\nexport interface ArgMaxAttrs {\n axis: number;\n}\n\nexport const ArgMin = 'ArgMin';\nexport type
ArgMinInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ArgMinAttrs {\n axis: number;\n}\n\nexport
const Asin = 'Asin';\nexport type AsinInputs = UnaryInputs;\n\nexport const Asinh = 'Asinh';\nexport type
AsinhInputs = UnaryInputs;\n\nexport const Atan = 'Atan';\nexport type AtanInputs = UnaryInputs;\n\nexport const
Atanh = 'Atanh';\nexport type AtanhInputs = UnaryInputs;\n\nexport const Atan2 = 'Atan2';\nexport type
Atan2Inputs = BinaryInputs;\n\nexport const AvgPool = 'AvgPool';\nexport type AvgPoolInputs =
Pick<NamedTensorInfoMap, 'x'>;\nexport interface AvgPoolAttrs {\n filterSize: [number, number]|number;\n
strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?:
'floor'|'round'|'ceil';\n}\n\nexport const AvgPoolGrad = 'AvgPoolGrad';\nexport type AvgPoolGradInputs =
Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPoolGradAttrs {\n filterSize: [number,
number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n}\n\nexport const AvgPool3D
= 'AvgPool3D';\nexport type AvgPool3DInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
AvgPool3DAttrs {\n filterSize: [number, number, number]|number;\n strides: [number, number,
number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n dataFormat:
'NDHWC'|'NCDHW';\n}\n\nexport const AvgPool3DGrad = 'AvgPool3DGrad';\nexport type
AvgPool3DGradInputs = Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPool3DGradAttrs {\n
filterSize: [number, number, number]|number;\n strides: [number, number, number]|number;\n pad:

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'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const BatchMatMul =
'BatchMatMul';\nexport type BatchMatMulInputs = Pick<NamedTensorInfoMap, 'a'|'b'>;\nexport interface
BatchMatMulAttrs {\n transposeA: boolean;\n transposeB: boolean;\n}\n\nexport const BatchToSpaceND =
'BatchToSpaceND';\nexport type BatchToSpaceNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
BatchToSpaceNDAttrs {\n blockShape: number[];\n crops: number[][];\n}\n\nexport type BinaryInputs =
Pick<NamedTensorInfoMap, 'a'|'b'>;\nexport const Bincount = 'Bincount';\nexport type BincountInputs =
Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport interface BincountAttrs {\n size: number;\n}\n\nexport const
BroadcastTo = 'BroadcastTo';\nexport type BroadcastToInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport
interface BroadCastToAttrs {\n shape: number[];\n inputShape: number[]; // for gradient}\n}\n\nexport const Cast =
'Cast';\nexport type CastInputs = UnaryInputs;\nexport interface CastAttrs {\n dtype: DataType;\n}\n\nexport const
Ceil = 'Ceil';\nexport type CeilInputs = UnaryInputs;\n\nexport const ClipByValue = 'ClipByValue';\nexport type
ClipByValueInputs = UnaryInputs;\nexport interface ClipByValueAttrs {\n clipValueMin: number;\n
clipValueMax: number;\n}\n\nexport const Complex = 'Complex';\nexport type ComplexInputs =
Pick<NamedTensorInfoMap, 'real'|'imag'>;\nexport const ComplexAbs = 'ComplexAbs';\nexport type
ComplexAbsInputs = UnaryInputs;\n\nexport const Concat = 'Concat';\nexport type ConcatInputs =
TensorInfo[];\nexport interface ConcatAttrs {\n axis: number;\n}\n\nexport const Conv2D = 'Conv2D';\nexport type
Conv2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv2DAttrs {\n strides: [number,
number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dilations:
[number, number]|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const Conv2DBackpropFilter =
'Conv2DBackpropFilter';\nexport type Conv2DBackpropFilterInputs = Pick<NamedTensorInfoMap,
'x'|'dy'>;\nexport interface Conv2DBackpropFilterAttrs {\n strides: [number, number]|number;\n pad:
'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?:
'floor'|'round'|'ceil';\n filterShape: [number, number, number, number];\n}\n\nexport const Conv2DBackpropInput =
'Conv2DBackpropInput';\nexport type Conv2DBackpropInputInputs = Pick<NamedTensorInfoMap,
'dy'|'filter'>;\nexport interface Conv2DBackpropInputAttrs {\n strides: [number, number]|number;\n pad:
'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?:
'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n\nexport const Conv3D =
'Conv3D';\nexport type Conv3DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv3DAttrs
{\n strides: [number, number, number]|number;\n pad: 'valid'|'same';\n dataFormat: 'NDHWC'|'NCDHW';\n
dilations: [number, number, number]|number;\n}\n\nexport const Conv3DBackpropFilterV2 =
'Conv3DBackpropFilterV2';\nexport type Conv3DBackpropFilterV2Inputs = Pick<NamedTensorInfoMap,
'x'|'dy'>;\n\nexport interface Conv3DBackpropFilterV2Attrs {\n strides: [number, number, number]|number;\n pad:
'valid'|'same';\n filterShape: [number, number, number, number, number];\n}\n\nexport const
Conv3DBackpropInputV2 = 'Conv3DBackpropInputV2';\nexport type Conv3DBackpropInputV2Inputs =\n
Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface Conv3DBackpropInputV2Attrs {\n strides: [number,
number, number]|number;\n pad: 'valid'|'same';\n inputShape: [number, number, number, number,
number];\n}\n\nexport const Cos = 'Cos';\nexport type CosInputs = UnaryInputs;\n\nexport const Cosh =
'Cosh';\nexport type CoshInputs = UnaryInputs;\n\nexport const Cumsum = 'Cumsum';\nexport type CumsumInputs
= Pick<NamedTensorInfoMap, 'x'>;\nexport interface CumsumAttrs {\n axis: number;\n exclusive: boolean;\n
reverse: boolean;\n}\n\nexport const CropAndResize = 'CropAndResize';\nexport type CropAndResizeInputs =\n
Pick<NamedTensorInfoMap, 'image'|'boxes'|'boxInd'>;\nexport interface CropAndResizeAttrs {\n cropSize:
[number, number];\n method: 'bilinear'|'nearest';\n extrapolationValue: number;\n}\n\nexport const DenseBincount
= 'DenseBincount';\nexport type DenseBincountInputs = Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport
interface DenseBincountAttrs {\n size: number;\n binaryOutput?: boolean;\n}\n\nexport const DepthToSpace =
'DepthToSpace';\nexport type DepthToSpaceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
DepthToSpaceAttrs {\n blockSize: number;\n dataFormat: 'NHWC'|'NCHW';\n}\n\nexport const
DepthwiseConv2dNative = 'DepthwiseConv2dNative';\nexport type DepthwiseConv2dNativeInputs =\n
Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface DepthwiseConv2dNativeAttrs {\n strides: [number,

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number]]number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number,
number]]number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\n\nexport const
DepthwiseConv2dNativeBackpropFilter =\n 'DepthwiseConv2dNativeBackpropFilter';\nexport type
DepthwiseConv2dNativeBackpropFilterInputs =\n Pick<NamedTensorInfoMap, 'x'|'dy'>;\nexport interface
DepthwiseConv2dNativeBackpropFilterAttrs {\n strides: [number, number]]number;\n dilations: [number,
number]]number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n filterShape: [number,
number, number, number];\n}\n\n\nexport const DepthwiseConv2dNativeBackpropInput =\n '\n 'DepthwiseConv2dNativeBackpropInput';\nexport type DepthwiseConv2dNativeBackpropInputInputs =\n '\n Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface DepthwiseConv2dNativeBackpropInputAttrs {\n
 strides: [number, number]]number;\n dilations: [number, number]]number;\n pad: 'valid'|'same'|number;\n
 dimRoundingMode?: 'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n}\n\n\nexport const
Diag = 'Diag';\nexport type DiagInputs = Pick<NamedTensorInfoMap, 'x'>;\n\n\nexport const Dilation2D =
'Dilation2D';\nexport type Dilation2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface
Dilation2DAttrs {\n strides: [number, number]]number;\n pad: 'valid'|'same'|number;\n dilations: [number,
number]]number;\n}\n}\n\n\nexport const Dilation2DBackpropInput = 'Dilation2DBackpropInput';\nexport type
Dilation2DBackpropInputInputs =\n '\n Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\n\nexport const
Dilation2DBackpropFilter = 'Dilation2DBackpropFilter';\nexport type Dilation2DBackpropFilterInputs =\n '\n Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\n\nexport const RealDiv = 'RealDiv';\nexport type RealDivInputs =
BinaryInputs;\n\n\nexport const Elu = 'Elu';\nexport type EluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\n\nexport
const EluGrad = 'EluGrad';\nexport type EluGradInputs = Pick<NamedTensorInfoMap, 'dy'|'y'>;\n\n\nexport const Erf
= 'Erf';\nexport type ErfInputs = UnaryInputs;\n\n\nexport const Equal = 'Equal';\nexport type EqualInputs =
BinaryInputs;\n\n\nexport const Exp = 'Exp';\nexport type ExpInputs = UnaryInputs;\n\n\nexport const ExpandDims =
'ExpandDims';\nexport type ExpandDimsInputs = Pick<NamedTensorInfoMap, 'input'>;\nexport interface
ExpandDimsAttrs {\n dim: number;\n}\n}\n\n\nexport const ExpM1 = 'ExpM1';\nexport type ExpM1Inputs =
UnaryInputs;\n\n\nexport const FFT = 'FFT';\nexport type FFTInputs = Pick<NamedTensorInfoMap,
'input'>;\n\n\nexport const Fill = 'Fill';\nexport interface FillAttrs {\n shape: number[];\n value: number|string;\n
dtype: DataType;\n}\n}\n\n\nexport const FlipLeftRight = 'FlipLeftRight';\nexport type FlipLeftRightInputs =
Pick<NamedTensorInfoMap, 'image'>;\n\n\nexport const Floor = 'Floor';\nexport type FloorInputs =
UnaryInputs;\n\n\nexport const FloorDiv = 'FloorDiv';\nexport type FloorDivInputs = BinaryInputs;\n\n\nexport const
FusedBatchNorm = 'FusedBatchNorm';\nexport type FusedBatchNormInputs =\n '\n Pick<NamedTensorInfoMap,
'x'|'scale'|'offset'|'mean'|'variance'>;\nexport interface FusedBatchNormAttrs {\n varianceEpsilon:
number;\n}\n}\n\n\nexport const GatherV2 = 'GatherV2';\nexport type GatherV2Inputs = Pick<NamedTensorInfoMap,
'x'|'indices'>;\nexport interface GatherV2Attrs {\n axis: number;\n batchDims: number;\n}\n}\n\n\nexport const
GatherNd = 'GatherNd';\nexport type GatherNdInputs = Pick<NamedTensorInfoMap, 'params'|'indices'>;\n\n\nexport
const Greater = 'Greater';\nexport type GreaterInputs = BinaryInputs;\n\n\nexport const GreaterEqual =
'GreaterEqual';\nexport type GreaterEqualInputs = BinaryInputs;\n\n\nexport const Identity = 'Identity';\nexport type
IdentityInputs = Pick<NamedTensorInfoMap, 'x'>;\n\n\nexport const IFFT = 'IFFT';\nexport type IFFTInputs =
Pick<NamedTensorInfoMap, 'input'>;\n\n\nexport const Imag = 'Imag';\nexport type ImagInputs =
Pick<NamedTensorInfoMap, 'input'>;\n\n\nexport const IsFinite = 'IsFinite';\nexport type IsFiniteInputs =
UnaryInputs;\n\n\nexport const IsInf = 'IsInf';\nexport type IsInfInputs = UnaryInputs;\n\n\nexport const IsNan =
'IsNan';\nexport type IsNanInputs = UnaryInputs;\n\n\nexport const LeakyRelu = 'LeakyRelu';\nexport type
LeakyReluInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface LeakyReluAttrs {\n alpha:
number;\n}\n}\n\n\nexport const Less = 'Less';\nexport type LessInputs = BinaryInputs;\n\n\nexport const LessEqual =
'LessEqual';\nexport type LessEqualInputs = BinaryInputs;\n\n\nexport const LinSpace = 'LinSpace';\nexport interface
LinSpaceAttrs {\n start: number;\n stop: number;\n num: number;\n}\n}\n\n\nexport const Log = 'Log';\nexport type
LogInputs = UnaryInputs;\n\n\nexport const Log1p = 'Log1p';\nexport type Log1pInputs = UnaryInputs;\n\n\nexport
const LogicalAnd = 'LogicalAnd';\nexport type LogicalAndInputs = BinaryInputs;\n\n\nexport const LogicalNot =
'LogicalNot';\nexport type LogicalNotInputs = Pick<NamedTensorInfoMap, 'x'>;\n\n\nexport const LogicalOr =

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PackAttrs {\n axis: number;\n}\n\nexport const PadV2 = 'PadV2';\nexport type PadV2Inputs =
Pick<NamedTensorInfoMap, 'x'>;\nexport interface PadV2Attrs {\n paddings: Array<[number, number]>;\n
constantValue: number;\n}\n\nexport const Pool = 'Pool';\nexport type PoolInputs = Pick<NamedTensorInfoMap,
'input'>;\n\nexport const Pow = 'Pow';\nexport type PowInputs = BinaryInputs;\n\nexport const Prelu =
'Prelu';\nexport type PreluInputs = Pick<NamedTensorInfoMap, 'x'|'alpha'>;\n\nexport const Prod = 'Prod';\nexport
type ProdInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ProdAttrs {\n axis: number|number[];\n
keepDims: boolean;\n}\n\nexport const Range = 'Range';\nexport interface RangeAttrs {\n start: number;\n stop:
number;\n step: number;\n dtype: 'float32'|'int32';\n}\n\nexport const Real = 'Real';\nexport type RealInputs =
Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Reciprocal = 'Reciprocal';\nexport type ReciprocalInputs =
UnaryInputs;\n\nexport const Relu = 'Relu';\nexport type ReluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport
const Reshape = 'Reshape';\nexport type ReshapeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
ReshapeAttrs {\n shape: number[];\n}\n\nexport const ResizeNearestNeighbor = 'ResizeNearestNeighbor';\nexport
type ResizeNearestNeighborInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface
ResizeNearestNeighborAttrs {\n alignCorners: boolean;\n halfPixelCenters: boolean;\n size: [number,
number];\n}\n\nexport const ResizeNearestNeighborGrad = 'ResizeNearestNeighborGrad';\nexport type
ResizeNearestNeighborGradInputs =\n Pick<NamedTensorInfoMap, 'images'|'dy'>;\nexport type
ResizeNearestNeighborGradAttrs = ResizeNearestNeighborAttrs;\n\nexport const ResizeBilinear =
'ResizeBilinear';\nexport type ResizeBilinearInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface
ResizeBilinearAttrs {\n alignCorners: boolean;\n halfPixelCenters: boolean;\n size: [number,
number];\n}\n\nexport const ResizeBilinearGrad = 'ResizeBilinearGrad';\nexport type ResizeBilinearGradInputs =
Pick<NamedTensorInfoMap, 'images'|'dy'>;\nexport type ResizeBilinearGradAttrs = ResizeBilinearAttrs;\n\nexport
const Relu6 = 'Relu6';\nexport type Relu6Inputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Reverse =
'Reverse';\nexport type ReverseInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ReverseAttrs {\n dims:
number|number[];\n}\n\nexport const Round = 'Round';\nexport type RoundInputs = UnaryInputs;\n\nexport const
Rsqrt = 'Rsqrt';\nexport type RsqrtInputs = UnaryInputs;\n\nexport const ScatterNd = 'ScatterNd';\nexport type
ScatterNdInputs = Pick<NamedTensorInfoMap, 'indices'|'updates'>;\nexport interface ScatterNdAttrs {\n shape:
number[];\n}\n\nexport const Select = 'Select';\nexport type SelectInputs = Pick<NamedTensorInfoMap,
'condition'|'t'|'e'>;\n\nexport const Selu = 'Selu';\nexport type SeluInputs = Pick<NamedTensorInfoMap,
'x'>;\n\nexport const Slice = 'Slice';\nexport type SliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface
SliceAttrs {\n begin: number|number[];\n size: number|number[];\n}\n\nexport const Sin = 'Sin';\nexport type
SinInputs = UnaryInputs;\n\nexport const Sinh = 'Sinh';\nexport type SinhInputs = UnaryInputs;\n\nexport const
Sign = 'Sign';\nexport type SignInputs = UnaryInputs;\n\nexport const Sigmoid = 'Sigmoid';\nexport type
SigmoidInputs = UnaryInputs;\n\nexport const Softplus = 'Softplus';\nexport type SoftplusInputs =
UnaryInputs;\n\nexport const Sqrt = 'Sqrt';\nexport type SqrtInputs = UnaryInputs;\n\nexport const Sum =
'Sum';\nexport type SumInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SumAttrs {\n axis:
number|number[];\n keepDims: boolean;\n}\n\nexport const SpaceToBatchND = 'SpaceToBatchND';\nexport type
SpaceToBatchNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SpaceToBatchNDAttrs {\n
blockShape: number[];\n paddings: number[][];\n}\n\nexport const SplitV = 'SplitV';\nexport type SplitVInputs =
Pick<NamedTensorInfoMap, 'x'>;\nexport interface SplitVAttrs {\n numOrSizeSplits: number[]|number;\n axis:
number;\n}\n\nexport const Softmax = 'Softmax';\nexport type SoftmaxInputs = Pick<NamedTensorInfoMap,
'logits'>;\nexport interface SoftmaxAttrs {\n dim: number;\n}\n\nexport const SquaredDifference =
'SquaredDifference';\nexport type SquaredDifferenceInputs = BinaryInputs;\n\nexport const Square =
'Square';\nexport type SquareInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Sub = 'Sub';\nexport type
SubInputs = BinaryInputs;\n\nexport const SparseToDense = 'SparseToDense';\nexport type SparseToDenseInputs
=\n Pick<NamedTensorInfoMap, 'sparseIndices'|'sparseValues'|'defaultValue'>;\nexport interface
SparseToDenseAttrs {\n outputShape: number[];\n}\n\nexport const StridedSlice = 'StridedSlice';\nexport type
StridedSliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface StridedSliceAttrs {\n begin: number[];\n
end: number[];\n strides: number[];\n beginMask: number;\n endMask: number;\n ellipsisMask: number;\n

```

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newAxisMask: number;\n shrinkAxisMask: number;\n}\n\nexport const Tan = 'Tan';\nexport type TanInputs =
UnaryInputs;\n\nexport const Tanh = 'Tanh';\nexport type TanhInputs = UnaryInputs;\n\nexport const Tile =
'Tile';\nexport type TileInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TileAttrs {\n reps:
number[];\n}\n\nexport const TopK = 'TopK';\nexport type TopKInputs = Pick<NamedTensorInfoMap,
'x'>;\nexport interface TopKAttrs {\n k: number;\n sorted: boolean;\n}\n\nexport const Transpose =
'Transpose';\nexport type TransposeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TransposeAttrs {\n
perm: number[];\n}\n\nexport const Unique = 'Unique';\nexport type UniqueInputs = Pick<NamedTensorInfoMap,
'x'>;\nexport interface UniqueAttrs {\n axis: number;\n}\n\nexport type UnaryInputs =
Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Unpack = 'Unpack';\nexport type UnpackInputs =
Pick<NamedTensorInfoMap, 'value'>;\nexport interface UnpackAttrs {\n axis: number;\n}\n\nexport const
UnsortedSegmentSum = 'UnsortedSegmentSum';\nexport type UnsortedSegmentSumInputs =\n
Pick<NamedTensorInfoMap, 'x'|'segmentIds'>;\nexport interface UnsortedSegmentSumAttrs {\n numSegments:
number;\n}\n\nexport const ZerosLike = 'ZerosLike';\nexport type ZerosLikeInputs = UnaryInputs;\n\n/**\n *
TensorFlow.js-only kernels\n */\nexport const Step = 'Step';\nexport type StepInputs = UnaryInputs;\nexport
interface StepAttrs {\n alpha: number;\n}\n\nexport const FromPixels = 'FromPixels';\nexport interface
FromPixelsInputs {\n pixels: PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n
HTMLVideoElement|ImageBitmap;\n}\n\nexport interface FromPixelsAttrs {\n numChannels: number;\n}\n\nexport
const RotateWithOffset = 'RotateWithOffset';\nexport type RotateWithOffsetInputs = Pick<NamedTensorInfoMap,
'image'>;\nexport interface RotateWithOffsetAttrs {\n radians: number;\n fillValue: number|[number, number,
number];\n center: number|[number, number];\n}\n\nexport const _FusedMatMul = '_FusedMatMul';\n//
tslint:disable-next-line: class-name\nexport interface _FusedMatMulInputs extends NamedTensorInfoMap {\n a:
TensorInfo;\n b: TensorInfo;\n bias?: TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\n// tslint:disable-
next-line: class-name\nexport interface _FusedMatMulAttrs {\n transposeA: boolean;\n transposeB: boolean;\n
activation: Activation;\n leakyreluAlpha?: number;\n}\n\nexport const FusedConv2D = 'FusedConv2D';\nexport
interface FusedConv2DInputs extends NamedTensorInfoMap {\n x: TensorInfo;\n filter: TensorInfo;\n bias?:
TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\n\nexport interface FusedConv2DAttrs {\n strides: [number,
number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dilations:
[number, number]|number;\n dimRoundingMode: 'floor'|'round'|'ceil';\n activation: Activation;\n leakyreluAlpha?:
number;\n}\n\nexport const FusedDepthwiseConv2D = 'FusedDepthwiseConv2D';\nexport interface
FusedDepthwiseConv2DInputs extends NamedTensorInfoMap {\n x: TensorInfo;\n filter: TensorInfo;\n bias?:
TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\n\nexport interface FusedDepthwiseConv2DAttrs {\n
strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NHWC'|'NCHW';\n dilations:
[number, number]|number;\n dimRoundingMode: 'floor'|'round'|'ceil';\n activation: Activation;\n leakyreluAlpha?:
number;\n}\n\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

=====\n
*/\nimport {env} from './environment';\nimport {getGlobal} from './global_util';\nimport {NamedGradientMap}
from './tape';\nimport {Tensor} from './tensor';\nimport {DataType, RecursiveArray} from './types';\n\nconst
kernelRegistry =\n getGlobal('kernelRegistry', () => new Map<string, KernelConfig>());\nconst gradRegistry =\n getGlobal('gradRegistry', () => new Map<string, GradConfig>());\n\nexport type DataId = object;\n\nntype
AttributeValue =\n number|number[]|boolean|boolean[]|string|string[]|NamedAttrMap;\n\n/** These are extra non-
tensor/primitive params passed to kernel functions. */\nexport type Attribute =
AttributeValue|RecursiveArray<AttributeValue>;\n\n/** Specifies the code to run when executing a kernel.

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*\nexport type KernelFunc = (params: {\n inputs: NamedTensorInfoMap,\n backend: {},\n attrs?:\n NamedAttrMap,\n}) => TensorInfo|TensorInfo[];\n\n/** The function to run when computing a gradient during
backprop. */\nexport type GradFunc = (\n dy: Tensor|Tensor[],\n saved: Tensor[],\n attrs: NamedAttrMap\n) => \n NamedGradientMap;\n\n/** Function that gets called after the backend initializes. */\nexport type KernelSetupFunc\n= (backend: {}) => void;\n\n/** Function that gets called right before the backend is disposed. */\nexport type\n KernelDisposeFunc = KernelSetupFunc;\n\n/** Config object for registering a kernel in the global registry.
*/\nexport interface KernelConfig {\n kernelName: string;\n backendName: string;\n kernelFunc: KernelFunc;\n setupFunc?: KernelSetupFunc;\n disposeFunc?: KernelDisposeFunc;\n}\n\n/** Config object for registering a
gradient in the global registry. */\nexport interface GradConfig {\n kernelName: string;\n inputsToSave?:\n string[];\n // When saveAllInputs is true, all inputs will be saved. Only use this flag\n // if inputs is an array of
Tensors.\n saveAllInputs?: boolean;\n outputsToSave?: boolean[];\n gradFunc: GradFunc;\n}\n\n/** Holds
metadata for a given tensor. */\nexport interface TensorInfo {\n dataId: DataId;\n shape: number[];\n dtype:\n DataType;\n}\n\nexport interface NamedTensorInfoMap {\n [name: string]: TensorInfo;\n}\n\nexport interface\n NamedAttrMap {\n [name: string]: Attribute;\n}\n\n/**\n * Returns the kernel function (code) associated with the
provided names.\n * @param kernelName The official name of the kernel.\n * @param backendName The
official name of the backend.\n */\nexport function getKernel(\n kernelName: string,\n backendName: string):\n KernelConfig {\n const key = makeKey(kernelName, backendName);\n return kernelRegistry.get(key);\n}\n\n/**\n * Returns the registered gradient info associated with the provided kernel.\n * @param kernelName The official TF
kernel name.\n */\nexport function getGradient(kernelName: string): GradConfig {\n return\n gradRegistry.get(kernelName);\n}\n\nexport function getKernelsForBackend(backendName: string): KernelConfig[]\n{\n const it = kernelRegistry.entries();\n const result: KernelConfig[] = [];\n while (true) {\n const {done,\n value} = it.next();\n if (done) {\n break;\n }\n const [key, config] = value;\n const [backend,] =\n key.split('_');\n if (backend === backendName) {\n result.push(config);\n }\n }\n return result;\n}\n\n/**\n * Registers the function (forward pass) for the kernel in a global registry.\n * @param config A config object with
the following properties:\n * - `kernelName` The official name of the kernel.\n * - `backendName` The official
name of the backend.\n * - `kernelFunc` The function to run during the forward pass of the kernel.\n * - `setupFunc`
Optional. Gets called once, after the backend initializes.\n * - `disposeFunc` Optional. Gets called once, right before
the backend is\n * disposed.\n */\nexport function registerKernel(config: KernelConfig) {\n const {kernelName,\n backendName} = config;\n const key = makeKey(kernelName, backendName);\n if (kernelRegistry.has(key)) {\n\n console.warn(\n `The kernel '${kernelName}' for backend ` +\n ` '${backendName}' is already
registered`);\n }\n kernelRegistry.set(key, config);\n}\n\n/**\n * Registers a gradient function for a given kernel in
the global registry,\n * to be used during the back-propagation of that kernel.\n * @param config An object with
the following properties:\n * - `kernelName` The name of the kernel that the gradient function is for.\n * -
`gradFunc` The function to run during back-propagation.\n */\nexport function registerGradient(config: GradConfig)\n{\n const {kernelName} = config;\n\n if (gradRegistry.has(kernelName)) {\n // TODO (yassogba) after 3.0 assess
whether we need to keep this gated\n // to debug mode.\n if (env().getBool('DEBUG')) {\n\n console.warn(`Overriding the gradient for '${kernelName}'`);\n }\n }\n gradRegistry.set(kernelName,\n config);\n}\n\n/**\n * Removes the kernel function from the registry.\n * @param kernelName The official
name of the kernel.\n * @param backendName The official name of the backend.\n */\nexport function\n unregisterKernel(\n kernelName: string,\n backendName: string): void {\n const key = makeKey(kernelName,\n backendName);\n if (!kernelRegistry.has(key)) {\n throw new Error(\n `The kernel '${kernelName}' for
backend ` +\n ` '${backendName}' is not registered`);\n }\n kernelRegistry.delete(key);\n}\n\n/**\n * Removes the
registered gradient from the global registry. */\nexport function unregisterGradient(kernelName: string): void {\n if\n (!gradRegistry.has(kernelName)) {\n throw new Error(\n `The gradient '${kernelName}' for backend is not
registered`);\n }\n gradRegistry.delete(kernelName);\n}\n\n/**\n * Finds kernels that have already been registered
to a backend and re-registers\n * them for a new backend. Useful for registering custom backends.\n * @param
registeredBackendName Already registered backend.\n * @param newBackendName New backend.\n */\nexport\n function copyRegisteredKernels(\n registeredBackendName: string,\n newBackendName: string): void {\n const

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kernels = getKernelsForBackend(registeredBackendName);\n kernels.forEach(kernelConfig => {\n const
newKernelConfig =\n Object.assign({}, kernelConfig, {backendName: newBackendName});\n
registerKernel(newKernelConfig);\n });\n}\n\nfunction makeKey(kernelName: string, backendName: string) {\n
return `${backendName}_${kernelName}`;\n}\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {env} from './environment';\nimport {BackendValues, DataType, TensorLike, TypedArray} from
 './types';\nimport * as base from './util_base';\nexport * from './util_base';\n\n/**\n * Create typed array for scalar
value. Used for storing in `DataStorage`.\n */\nexport function createScalarValue(\n value: DataType, dtype:
 DataType): BackendValues {\n if (dtype === 'string') {\n return encodeString(value);\n }\n return
 toTypedArray([value], dtype);\n}\n\nfunction noConversionNeeded(a: TensorLike, dtype: DataType): boolean {\n
return (a instanceof Float32Array && dtype === 'float32') ||\n (a instanceof Int32Array && dtype === 'int32')
||\n (a instanceof Uint8Array && dtype === 'bool');\n}\n\nexport function toTypedArray(a: TensorLike, dtype:
 DataType): TypedArray {\n if (dtype === 'string') {\n throw new Error('Cannot convert a string[] to a
TypedArray');\n }\n if (Array.isArray(a)) {\n a = base.flatten(a);\n }\n if (env().getBool('DEBUG')) {\n
base.checkConversionForErrors(a as number[], dtype);\n }\n if (noConversionNeeded(a, dtype)) {\n return a as
TypedArray;\n }\n if (dtype == null || dtype === 'float32' || dtype === 'complex64') {\n return new
Float32Array(a as number[]);\n } else if (dtype === 'int32') {\n return new Int32Array(a as number[]);\n } else if
(dtype === 'bool') {\n const bool = new Uint8Array((a as number[]).length);\n for (let i = 0; i < bool.length; ++i)
{\n if (Math.round((a as number[])[i]) !== 0) {\n bool[i] = 1;\n }\n }\n return bool;\n } else {\n
throw new Error(`Unknown data type ${dtype}`);\n }\n}\n\n/**\n * Returns the current high-resolution time in
milliseconds relative to an\n * arbitrary time in the past. It works across different platforms (node.js,\n *
browsers).\n */\n * ```\n * console.log(tf.util.now());\n * ```\n */\n * @doc {heading: 'Util', namespace: 'util'}\n
*\nexport function now(): number {\n return env().platform.now();\n}\n\n/**\n * Returns a platform-specific
implementation of\n * `fetch` (https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n */\n * If `fetch` is
defined on the global object (`window`, `process`, etc.),\n * `tf.util.fetch` returns that function.\n */\n * If not,
`tf.util.fetch` returns a platform-specific solution.\n */\n * ```\n * const resource = await
tf.util.fetch('https://unpkg.com/@tensorflow/tfjs');\n * // handle response\n * ```\n */\n * @doc {heading: 'Util'}\n
*\nexport function fetch(\n path: string, requestInits?: RequestInit): Promise<Response> {\n return
env().platform.fetch(path, requestInits);\n}\n\n/**\n * Encodes the provided string into bytes using the provided
encoding scheme.\n */\n * @param s The string to encode.\n * @param encoding The encoding scheme. Defaults to
utf-8.\n */\n * @doc {heading: 'Util'}\n *\nexport function encodeString(s: string, encoding = 'utf-8'): Uint8Array
{\n encoding = encoding || 'utf-8';\n return env().platform.encode(s, encoding);\n}\n\n/**\n * Decodes the provided
bytes into a string using the provided encoding scheme.\n */\n * @param bytes The bytes to decode.\n */\n * @param
encoding The encoding scheme. Defaults to utf-8.\n */\n * @doc {heading: 'Util'}\n *\nexport function
decodeString(bytes: Uint8Array, encoding = 'utf-8'): string {\n encoding = encoding || 'utf-8';\n return
env().platform.decode(bytes, encoding);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*/
import {BackendTimer, BackendTimingInfo} from './backends/backend';
import {env} from './environment';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {DataType, DataTypeMap, TypedArray} from './types';
import * as util from './util';
export type KernelProfile = {
 kernelName: string,
 outputs: Tensor[],
 inputs: NamedTensorMap,
 timeMs: Promise<number|{error: string}>,
 extraInfo: Promise<string>};
export class Profiler {
 constructor(private backendTimer: BackendTimer, private logger?: Logger) {
 if (logger == null) {
 this.logger = new Logger();
 }
 }
 profileKernel(kernelName: string, inputs: NamedTensorMap, f: () => Tensor[]): KernelProfile {
 let outputs: Tensor[];
 const holdResultWrapperFn = () => {
 outputs = f();
 };
 let timer: Promise<BackendTimingInfo>;
 const start = util.now();
 if (this.backendTimer.timerAvailable()) {
 timer = this.backendTimer.time(holdResultWrapperFn);
 } else {
 holdResultWrapperFn();
 }
 outputs.map(output => output.dataSync());
 timer = Promise.resolve({kernelMs: util.now() - start});
 if (env().getBool('CHECK_COMPUTATION_FOR_ERRORS')) {
 for (let i = 0; i < outputs.length; i++) {
 const output = outputs[i];
 // Dangling promise here because we don't want to propagate up
 // asynchronicity.
 output.data().then(tensorVals => {
 checkComputationForErrors(tensorVals, output.dtype, kernelName);
 });
 }
 }
 const kernelProfile = {
 kernelName,
 outputs,
 inputs,
 timeMs: timer.then(timing => timing.kernelMs),
 extraInfo: timer.then(timing => timing.getExtraProfileInfo() != null ? timing.getExtraProfileInfo() : "")
 };
 return kernelProfile;
 }
 logKernelProfile(kernelProfile: KernelProfile): void {
 const {kernelName, outputs, timeMs, inputs, extraInfo} = kernelProfile;
 outputs.forEach(result => {
 Promise.all([result.data(), timeMs, extraInfo]).then(valueContainer => {
 this.logger.logKernelProfile(kernelName, result, valueContainer[0], valueContainer[1], inputs, valueContainer[2]);
 });
 });
 }
 export function checkComputationForErrors<D extends DataType>(vals: DataTypeMap[D], dtype: D, kernelName: string): boolean {
 if (dtype !== 'float32') {
 // Only floating point computations will generate NaN values
 return false;
 }
 for (let i = 0; i < vals.length; i++) {
 const num = vals[i] as number;
 if (isNaN(num) || !isFinite(num)) {
 // Throwing custom exception so behavior is testable.
 console.warn('Found ${num} in the result of ${kernelName}');
 return true;
 }
 }
 return false;
 }
 export class Logger {
 logKernelProfile(name: string, result: Tensor, vals: TypedArray, timeMs: number|{error: string}, inputs: NamedTensorMap, extraInfo?: string) {
 const time = typeof timeMs === 'number' ? util.rightPad(`${timeMs}ms`, 9) : timeMs['error'];
 const paddedName = util.rightPad(name, 25);
 const rank = result.rank;
 const size = result.size;
 const shape = util.rightPad(result.shape.toString(), 14);
 let inputShapesDescription = "";
 for (const name in inputs) {
 const input = inputs[name];
 if (input != null) {
 // The input might be a non-tensor (e.g HTMLImageElement), in which case
 // we claim the output shape as input shape.
 const inputShape = input.shape || result.shape;
 const inputRank = inputShape.length;
 inputShapesDescription += `${name}: ${inputRank}D ${inputRank > 0 ? inputShape : ""}`;
 }
 }
 console.log(`%c${paddedName} \\t%c${time} \\t%c${rank}D ${shape} \\t%c${size} \\t%c${inputShapesDescription} \\t%c${extraInfo}`, 'font-weight:bold', 'color:red', 'color:blue', 'color: orange', 'color: green', 'color: steelblue');
 }
 }
}
/*
=====
*/
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import * as util from './util';
export interface TapeNode {
 id: number;
 kernelName: string;
 outputs: Tensor[];
 inputs:

```

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NamedTensorMap;\n // Optional params, defined only for ops with gradient impl.\n gradient?: (dys: Tensor[]) =>
NamedGradientMap;\n saved?: Tensor[];\n\n\nexport type NamedGradientMap = {\n [inputName: string]: () =>
Tensor;\n};\n\n/**\n * Computes a list of TapeNodes that connect x to y, filtering everything else\n * out and
preserving the order of the original tape elements.\n *\n * @param tape The tape elements to filter.\n *\n * @param xs
The input Tensors.\n *\n * @param y The output Tensor.\n */\nexport function getFilteredNodesXToY(\n tape:
TapeNode[], xs: Tensor[], y: Tensor): TapeNode[] {\n // Forward pass to compute all the nodes and Tensors that are
transitively a\n // function of x.\n const tensorsFromX: {[tensorId: number]: boolean} = {};\n const nodesFromX:
{[nodeId: number]: boolean} = {};\n for (let i = 0; i < xs.length; i++) {\n tensorsFromX[xs[i].id] = true;\n }\n for (let i = 0; i < tape.length; i++) {\n const node = tape[i];\n const nodeInputs = node.inputs;\n for (const
inputName in nodeInputs) {\n const input = nodeInputs[inputName];\n let anyInputFromX = false;\n for
(let j = 0; j < xs.length; j++) {\n if (tensorsFromX[input.id]) {\n node.outputs.forEach(output =>
tensorsFromX[output.id] = true);\n anyInputFromX = true;\n nodesFromX[node.id] = true;\n break;\n }\n }\n if (anyInputFromX) {\n break;\n }\n }\n }\n // Backward pass to find all of
the nodes and Tensors that lead to y.\n const tensorsLeadToY: {[tensorId: number]: boolean} = {};\n tensorsLeadToY[y.id] = true;\n const nodesToY: {[nodeId: number]: boolean} = {};\n for (let i = tape.length - 1;
i >= 0; i--) {\n const node = tape[i];\n const nodeInputs = node.inputs;\n // If any of the outputs lead to y,
mark all of the inputs as leading to y.\n for (let j = 0; j < node.outputs.length; j++) {\n if
(tensorsLeadToY[node.outputs[j].id]) {\n for (const inputName in nodeInputs) {\n tensorsLeadToY[nodeInputs[inputName].id] = true;\n nodesToY[node.id] = true;\n break;\n }\n }\n }\n // Return the paths that come from x and lead to y.\n const filteredTape: TapeNode[] = [];\n for (let
i = 0; i < tape.length; i++) {\n const node = tape[i];\n if (nodesFromX[node.id] && nodesToY[node.id]) {\n
// Prune the inputs from the node that aren't a function of x.\n const prunedInputs: {[inputName: string]: Tensor}
= {};\n for (const inputName in node.inputs) {\n const nodeInput = node.inputs[inputName];\n if
(tensorsFromX[nodeInput.id]) {\n prunedInputs[inputName] = nodeInput;\n }\n }\n // Copy the
node and overwrite inputsAndArgs to the pruned version.\n const prunedNode = Object.assign({}, node);\n prunedNode.inputs = prunedInputs;\n prunedNode.outputs = node.outputs;\n filteredTape.push(prunedNode);\n }\n }\n return filteredTape;\n}\n\n/**\n * Backpropagate gradients through
the filtered TapeNodes.\n *\n * @param tensorAccumulatedGradientMap A map of Tensor to its gradient. This
map\n * is mutated by this method.\n *\n * @param filteredTape The filtered TapeNodes to backprop through.\n
*/\nexport function backpropagateGradients(\n tensorAccumulatedGradientMap: {[tensorId: number]: Tensor},\n filteredTape: TapeNode[], tidy: (f: Function) => Tensor,\n add: (a: Tensor, b: Tensor) => Tensor) {\n // Walk the
tape backward and keep a map of Tensor to its gradient.\n for (let i = filteredTape.length - 1; i >= 0; i--) {\n const
node = filteredTape[i];\n const dys: Tensor[] = [];\n node.outputs.forEach(o => {\n const gradTensor =
tensorAccumulatedGradientMap[o.id];\n if (gradTensor !== null) {\n dys.push(gradTensor);\n } else {\n
// This particular output is not in the back-propagation subgraph, so it\n // does not affect the final output, thus
we put null for its dy.\n dys.push(null);\n }\n });\n if (node.gradient == null) {\n throw new Error(\n
 `Cannot compute gradient: gradient function not found` +\n `for ${node.kernelName}.`);\n }\n //
Backprop dy through this node and accumulate gradients over the inputs.\n const inputGradients =
node.gradient(dys);\n for (const inputName in node.inputs) {\n if (!(inputName in inputGradients)) {\n
throw new Error(\n `Cannot backprop through input ${inputName}.` +\n `Available gradients found:
${Object.keys(inputGradients)}.`);\n }\n // Call the gradient function.\n const dx = tidy(() =>
inputGradients[inputName]());\n if (dx.dtype !== 'float32') {\n throw new Error(\n `Error in gradient
for op ${\n node.kernelName}. The gradient of input ` +\n `${inputName} must have 'float32'
dtype, but has '${dx.dtype}'`);\n }\n const x = node.inputs[inputName];\n if (!util.arraysEqual(dx.shape,
x.shape)) {\n throw new Error(\n `Error in gradient for op ${\n node.kernelName}. The gradient
of input ` +\n `${inputName}` has shape '${dx.shape}', which does not match ` +\n `the shape of the
input '${x.shape}'`);\n }\n if (tensorAccumulatedGradientMap[x.id] == null) {\n tensorAccumulatedGradientMap[x.id] = dx;\n } else {\n const curGradient =

```

```

tensorAccumulatedGradientMap[x.id];\n tensorAccumulatedGradientMap[x.id] = add(curGradient, dx);\n curGradient.dispose();\n }\n }\n }\n }\n"}\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {DataType, TypedArray} from './types';\nimport {computeStrides, isString, rightPad, sizeFromShape} from './util';\n\n// Maximum number of values before we decide to show ellipsis.\nconst FORMAT_LIMIT_NUM_VALS = 20;\n// Number of first and last values to show when displaying a, b,...,y, z.\nconst FORMAT_NUM_FIRST_LAST_VALS = 3;\n// Number of significant digits to show.\nconst FORMAT_NUM_SIG_DIGITS = 7;\n\nexport function tensorToString(\n vals: TypedArray|string[], shape: number[], dtype: DataType,\n verbose: boolean) {\n const strides = computeStrides(shape);\n const padPerCol = computeMaxSizePerColumn(vals, shape, dtype, strides);\n const rank = shape.length;\n const valsLines = subTensorToString(vals, shape, dtype, strides, padPerCol);\n const lines = ['Tensor'];\n if (verbose) {\n lines.push(` dtype: ${dtype}`);\n lines.push(` rank: ${rank}`);\n lines.push(` shape: [${shape}]`);\n lines.push(` values:`);\n }\n lines.push(valsLines.map(l => ' ' + l).join('\\n'));\n return lines.join('\\n');\n}\n\nfunction computeMaxSizePerColumn(\n vals: TypedArray|string[], shape: number[], dtype: DataType,\n strides: number[]): number[] {\n const n = sizeFromShape(shape);\n const numCols = strides[strides.length - 1];\n const padPerCol = new Array(numCols).fill(0);\n const rank = shape.length;\n const valuesOrTuples =\n dtype === 'complex64' ? createComplexTuples(vals) : vals;\n if (rank > 1) {\n for (let row = 0; row < n / numCols; row++) {\n const offset = row * numCols;\n for (let j = 0; j < numCols; j++) {\n padPerCol[j] = Math.max(\n padPerCol[j],\n valToString(valuesOrTuples[offset + j], 0, dtype).length);\n }\n }\n }\n return padPerCol;\n}\n\nfunction valToString(\n val: number|string|[number, number], pad: number, dtype: DataType) {\n let valStr: string;\n if (Array.isArray(val)) {\n valStr = `${parseFloat(val[0].toFixed(FORMAT_NUM_SIG_DIGITS))} + ` +\n `${parseFloat(val[1].toFixed(FORMAT_NUM_SIG_DIGITS))}j`;\n } else if (isString(val)) {\n valStr = `${val}`;\n } else if (dtype === 'bool') {\n valStr = boolNumToString(val);\n } else {\n valStr = parseFloat(val.toFixed(FORMAT_NUM_SIG_DIGITS)).toString();\n }\n return rightPad(valStr, pad);\n}\n\nfunction boolNumToString(v: number): string {\n return v === 0 ? 'false' : 'true';\n}\n\nfunction subTensorToString(\n vals: TypedArray|string[], shape: number[], dtype: DataType,\n strides: number[], padPerCol: number[], isLast = true): string[] {\n const storagePerElement = dtype === 'complex64' ? 2 : 1;\n const size = shape[0];\n const rank = shape.length;\n if (rank === 0) {\n if (dtype === 'complex64') {\n const complexTuple = createComplexTuples(vals);\n return [valToString(complexTuple[0], 0, dtype)];\n }\n if (dtype === 'bool') {\n return [boolNumToString(vals[0] as number)];\n }\n return [vals[0].toString()];\n }\n if (rank === 1) {\n if (size > FORMAT_LIMIT_NUM_VALS) {\n const firstValsSize = FORMAT_NUM_FIRST_LAST_VALS * storagePerElement;\n let firstVals = Array.from<number|string|[number, number]>(\n vals.slice(0, firstValsSize));\n let lastVals = Array.from<number|string|[number, number]>(\n vals.slice(\n (size - FORMAT_NUM_FIRST_LAST_VALS) * storagePerElement,\n size * storagePerElement));\n if (dtype === 'complex64') {\n firstVals = createComplexTuples(firstVals);\n lastVals = createComplexTuples(lastVals);\n }\n return [\n '[' +\n firstVals.map((x, i) => valToString(x, padPerCol[i], dtype))\n .join(', ') +\n ', ...,' +\n lastVals\n .map(\n (x, i) => valToString(\n x, padPerCol[size -\n FORMAT_NUM_FIRST_LAST_VALS + i], dtype))\n .join(', ') +\n '']\n];\n }\n const displayVals: Array<number|string|[number, number]> =\n dtype === 'complex64' ? createComplexTuples(vals)\n : Array.from<number|string>(vals);\n return [\n '[' +\n displayVals.map((x, i) =>

```



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Requested out of range element at ${locs}.` +\n ` Buffer shape=${this.shape}`;\n throw new
Error(msg);\n }\n i++;\n }\n let index = locs[locs.length - 1];\n for (let i = 0; i < locs.length - 1; ++i) {\n
 index += this.strides[i] * locs[i];\n }\n return this.values[index] as SingleValueMap[D];\n }\n\n
locToIndex(locs: number[]): number {\n if (this.rank === 0) {\n return 0;\n } else if (this.rank === 1) {\n
return locs[0];\n }\n let index = locs[locs.length - 1];\n for (let i = 0; i < locs.length - 1; ++i) {\n index +=
this.strides[i] * locs[i];\n }\n return index;\n }\n\n
indexToLoc(index: number): number[] {\n if (this.rank ===
0) {\n return [];\n } else if (this.rank === 1) {\n return [index];\n }\n const locs: number[] = new
Array(this.shape.length);\n for (let i = 0; i < locs.length - 1; ++i) {\n locs[i] = Math.floor(index /
this.strides[i]);\n index -= locs[i] * this.strides[i];\n }\n locs[locs.length - 1] = index;\n return locs;\n
}\n\n
get rank() {\n return this.shape.length;\n }\n\n
/**\n * Creates an immutable `tf.Tensor` object from the buffer.\n
*\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\n toTensor(): Tensor<R> {\n return
trackerFn().makeTensor(this.values, this.shape, this.dtype) as\n Tensor<R>;\n }\n}\n\n
export interface
TensorTracker {\n makeTensor(\n values: DataValues, shape: number[], dtype: DataType,\n backend?:
Backend): Tensor;\n makeVariable(\n initialValue: Tensor, trainable?: boolean, name?: string,\n dtype?:
DataType): Variable;\n incRef(a: Tensor, backend: Backend): void;\n disposeTensor(t: Tensor): void;\n
disposeVariable(v: Variable): void;\n read(dataId: DataId): Promise<BackendValues>;\n readSync(dataId: DataId):
BackendValues;\n }\n\n
/**\n * The Tensor class calls into this handler to delegate chaining operations.\n */\n
export interface OpHandler {\n cast<T extends Tensor>(x: T, dtype: DataType): T;\n buffer<R extends Rank, D extends
DataType>(\n shape: ShapeMap[R], dtype: D,\n values?: DataTypeMap[D]): TensorBuffer<R, D>;\n print<T
extends Tensor>(x: T, verbose: boolean): void;\n clone<T extends Tensor>(x: T): T;\n // TODO(yassogba) bring
reshape back?\n }\n\n
// For tracking tensor creation and disposal.\n
let trackerFn: () => TensorTracker = null;\n\n
// Used by chaining methods to call into ops.\n
let opHandler: OpHandler = null;\n\n
// Used to warn about deprecated
methods.\n
let deprecationWarningFn: (msg: string) => void = null;\n\n
// This here so that we can use this method on
dev branches and keep the\n\n
functionality at master.\n\n
tslint:disable-next-line:no-unused-
expression\n
[deprecationWarningFn];\n\n
/**\n * An external consumer can register itself as the tensor tracker. This
way\n * the Tensor class can notify the tracker for every tensor created and\n * disposed.\n */\n
export function
setTensorTracker(fn: () => TensorTracker) {\n trackerFn = fn;\n }\n\n
/**\n * An external consumer can register
itself as the op handler. This way the\n * Tensor class can have chaining methods that call into ops via the op\n *
handler.\n */\n
export function setOpHandler(handler: OpHandler) {\n opHandler = handler;\n }\n\n
/**\n * Sets the
deprecation warning function to be used by this file. This way the\n * Tensor class can be a leaf but still use the
environment.\n */\n
export function setDeprecationWarningFn(fn: (msg: string) => void) {\n deprecationWarningFn
= fn;\n }\n\n
/**\n * We wrap data id since we use weak map to avoid memory leaks.\n * Since we have our own
memory management, we have a reference counter\n * mapping a tensor to its data, so there is always a pointer
(even if that\n * data is otherwise garbage collectable).\n * See https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/WeakMap\n */\n
export type DataId = object; // object
instead of {} to force non-primitive.\n\n
// Declare this namespace to make Tensor class augmentation work in
google3.\n
export declare namespace Tensor {\n\n
/**\n * A `tf.Tensor` object represents an immutable,
multidimensional array of\n * numbers that has a shape and a data type.\n * See `tf.tensor` for details on how to
create a `tf.Tensor`.\n */\n
@doc {heading: 'Tensors', subheading: 'Classes'}\n
export class Tensor<R extends
Rank = Rank> {\n /** Unique id of this tensor. */\n readonly id: number;\n /**\n * Id of the bucket holding the
data for this tensor. Multiple arrays can\n * point to the same bucket (e.g. when calling array.reshape()).\n */\n
readonly dataId: DataId;\n /** The shape of the tensor. */\n readonly shape: ShapeMap[R];\n /** Number of elements in the
tensor. */\n readonly size: number;\n /** The data type for the array. */\n readonly dtype: DataType;\n /** The
rank type for the array (see `Rank` enum). */\n readonly rankType: R;\n\n
/** Whether this tensor has been
globally kept. */\n kept = false;\n /** The id of the scope this tensor is being tracked in. */\n scopeId: number;\n\n
/**\n * Number of elements to skip in each dimension when indexing. See\n *
https://docs.scipy.org/doc/numpy/reference/generated/numpy.ndarray.strides.html\n */\n
readonly strides:
number[];\n\n
constructor(shape: ShapeMap[R], dtype: DataType, dataId: DataId, id: number) {\n this.shape =

```

```

shape.slice() as ShapeMap[R];\n this.dtype = dtype || 'float32';\n this.size = util.sizeFromShape(shape);\n this.strides = computeStrides(shape);\n this.dataId = dataId;\n this.id = id;\n this.rankType = (this.rank < 5 ?\n this.rank.toString() : 'higher') as R;\n }\n\n get rank(): number {\n return this.shape.length;\n }\n\n /**\n * Returns a promise of `tf.TensorBuffer` that holds the underlying data.\n * @doc {heading: 'Tensors',\n subheading: 'Classes'}\n */\n async buffer<D extends DataType = 'float32'>(): Promise<TensorBuffer<R, D>> {\n const vals = await this.data<D>();\n return opHandler.buffer(this.shape, this.dtype as D, vals);\n }\n\n /**\n * Returns a `tf.TensorBuffer` that holds the underlying data.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n bufferSync<D extends DataType = 'float32'>(): TensorBuffer<R, D> {\n return opHandler.buffer(this.shape,\n this.dtype as D, this.dataSync());\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is\n done\n * asynchronously.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async array():\n Promise<ArrayMap[R]> {\n const vals = await this.data();\n return toNestedArray(this.shape, vals) as\n ArrayMap[R];\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is done\n * synchronously.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n arraySync(): ArrayMap[R] {\n return toNestedArray(this.shape, this.dataSync()) as ArrayMap[R];\n }\n\n /**\n * Asynchronously downloads the\n values from the `tf.Tensor`. Returns a\n * promise of `TypedArray` that resolves when the computation has\n finished.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async data<D extends DataType =\n NumericDataType>(): Promise<DataTypeMap[D]> {\n this.throwIfDisposed();\n const data =\n trackerFn().read(this.dataId);\n if (this.dtype === 'string') {\n const bytes = await data as Uint8Array[];\n try\n {\n return bytes.map(b => util.decodeString(b)) as\n DataTypeMap[D];\n } catch {\n throw new Error(\n '\n Failed to decode the string bytes into utf-8. '\n +\n '\n To get the original bytes, call tensor.bytes().');\n }\n }\n return data as Promise<DataTypeMap[D]>;\n }\n\n /**\n * Synchronously downloads the values from the\n `tf.Tensor`. This blocks the\n * UI thread until the values are ready, which can cause performance\n issues.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n dataSync<D extends DataType = NumericDataType>():\n DataTypeMap[D] {\n this.throwIfDisposed();\n const data = trackerFn().readSync(this.dataId);\n if (this.dtype\n === 'string') {\n try {\n return (data as Uint8Array[]).map(b => util.decodeString(b)) as\n DataTypeMap[D];\n } catch {\n throw new Error(\n '\n Failed to decode the string bytes into utf-8. '\n +\n '\n To get the original bytes, call tensor.bytes().');\n }\n }\n return data as DataTypeMap[D];\n }\n\n /**\n * Returns the underlying bytes of the tensor's data.\n */\n async bytes(): Promise<Uint8Array[]|Uint8Array> {\n this.throwIfDisposed();\n const data = await trackerFn().read(this.dataId);\n if (this.dtype === 'string') {\n return data as Uint8Array[];\n } else {\n return new Uint8Array((data as TypedArray).buffer);\n }\n }\n\n /**\n * Disposes `tf.Tensor` from memory.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n dispose(): void {\n if (this.isDisposed) {\n return;\n }\n trackerFn().disposeTensor(this);\n this.isDisposedInternal = true;\n }\n\n protected isDisposedInternal = false;\n get isDisposed(): boolean {\n return this.isDisposedInternal;\n }\n\n throwIfDisposed() {\n if (this.isDisposed) {\n throw new Error(`Tensor\n is disposed.`);\n }\n }\n\n /**\n * Prints the `tf.Tensor`. See `tf.print` for details.\n * @param verbose\n Whether to print verbose information about the tensor,\n * including dtype and size.\n * @doc {heading:\n 'Tensors', subheading: 'Classes'}\n */\n print(verbose = false): void {\n return opHandler.print(this, verbose);\n }\n\n /**\n * Returns a copy of the tensor. See `tf.clone` for details.\n * @doc {heading: 'Tensors', subheading:\n 'Classes'}\n */\n clone<T extends Tensor>(this: T): T {\n this.throwIfDisposed();\n return\n opHandler.clone(this);\n }\n\n /**\n * Returns a human-readable description of the tensor. Useful for logging.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n toString(verbose = false): string {\n const vals =\n this.dataSync();\n return tensorToString(vals, this.shape, this.dtype, verbose);\n }\n\n cast<T extends this>(dtype:\n DataType): T {\n this.throwIfDisposed();\n return opHandler.cast(this as T, dtype);\n }\n\n variable(trainable =\n true, name?: string, dtype?: DataType): Variable<R> {\n this.throwIfDisposed();\n return\n trackerFn().makeVariable(this, trainable, name, dtype) as\n Variable<R>;\n }\n\n Object.defineProperty(Tensor, Symbol.hasInstance, {\n value: (instance: Tensor) => {\n // Implementation\n note: we should use properties of the object that will be\n // defined before the constructor body has finished\n executing (methods).\n // This is because when this code is transpiled by babel, babel will call\n //

```



```

backend. *^/nexport type BackendValues = Float32Array|Int32Array|Uint8Array|Uint8Array[];\n\nexport enum
Rank {\n R0 = 'R0',\n R1 = 'R1',\n R2 = 'R2',\n R3 = 'R3',\n R4 = 'R4',\n R5 = 'R5',\n R6 = 'R6'\n}\n\nexport
type FlatVector = boolean[]|number[]|TypedArray;\n\nexport type RegularArray<T> =\n
T[]|T[][]|T[][][]|T[][][][]|T[][][][][]|T[][][][][];\n\n// tslint:disable-next-line:no-any\n\nexport interface
RecursiveArray<T extends any> {\n [index: number]: T|RecursiveArray<T>;\n}\n\n// Looks for upcasting types.
Used, for example, in operations with mixed dtype\n\nenum UpcastInt32AndMap {\n 'float32' = 'float32',\n
'int32' = 'int32',\n 'bool' = 'int32',\n 'complex64' = 'complex64'\n}\n\nenum UpcastBoolAndMap {\n 'float32' =
'float32',\n 'int32' = 'int32',\n 'bool' = 'bool',\n 'complex64' = 'complex64'\n}\n\nenum UpcastFloat32AndMap {\n
'float32' = 'float32',\n 'int32' = 'float32',\n 'bool' = 'float32',\n 'complex64' = 'complex64'\n}\n\nenum
UpcastComplex64AndMap {\n 'float32' = 'complex64',\n 'int32' = 'complex64',\n 'bool' = 'complex64',\n
'complex64' = 'complex64'\n}\n\nconst upcastTypeMap = {\n 'float32': UpcastFloat32AndMap,\n 'int32':
UpcastInt32AndMap,\n 'bool': UpcastBoolAndMap,\n 'complex64': UpcastComplex64AndMap\n};\n\nexport
function upcastType(typeA: DataType, typeB: DataType): DataType {\n if (typeA === 'string' || typeB === 'string')
{\n if (typeA === 'string' && typeB === 'string') {\n return 'string';\n }\n throw new Error(`Can not upcast
${typeA} with ${typeB}`);\n }\n return upcastTypeMap[typeA][typeB];\n}\n\n/** Returns the output type after
summation. */\n\nexport function sumOutType(type: DataType): DataType {\n return upcastType(type,
'int32');\n}\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike =\n
TypedArray|number|boolean|string|RecursiveArray<number|number[]|TypedArray>|\n
RecursiveArray<boolean>|RecursiveArray<string>|Uint8Array[];\n\nexport type ScalarLike =
number|boolean|string|Uint8Array;\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike1D =
TypedArray|number[]|boolean[]|string[]|Uint8Array[];\n\n/** @docalias TypedArray|Array */\n\nexport type
TensorLike2D = TypedArray|number[]|number[][]|boolean[]|boolean[][]|\n
string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike3D =
TypedArray|number[]|number[][]|boolean[]|\n
boolean[][]|string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport type
TensorLike4D = TypedArray|number[]|number[][]|boolean[]|\n
boolean[][]|string[]|string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport
type TensorLike5D =\n TypedArray|number[]|number[][]|boolean[]|boolean[][]|string[]|\n
string[][]|Uint8Array[]|Uint8Array[][];\n\n/** @docalias TypedArray|Array */\n\nexport type TensorLike6D
=\n TypedArray|number[]|number[][]|boolean[]|boolean[][]|string[]|\n
string[][]|Uint8Array[]|Uint8Array[][];\n\n/** Type for representing image data in Uint8Array
type. */\n\nexport interface PixelData {\n width: number;\n height: number;\n data: Uint8Array;\n}\n\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */\n
====\n\n*/\n\nimport {Tensor} from './tensor';\nimport {TensorContainer, TensorContainerArray} from
'./tensor_types';\nimport {upcastType} from './types';\nimport {assert} from './util';\n\nexport function
makeTypesMatch<T extends Tensor>(a: T, b: T): [T, T] {\n if (a.dtype === b.dtype) {\n return [a, b];\n }\n
const dtype = upcastType(a.dtype, b.dtype);\n return [a.cast(dtype), b.cast(dtype)];\n}\n\nexport function
assertTypesMatch(a: Tensor, b: Tensor): void {\n assert(\n a.dtype === b.dtype,\n () => `The dtypes of the
first(${a.dtype}) and` +\n `second(${b.dtype}) input must match`);\n}\n\nexport function
isTensorInList(tensor: Tensor, tensorList: Tensor[]): boolean {\n return tensorList.some(x => x.id ===
tensor.id);\n}\n\n/**\n * Extracts any `Tensor`s found within the provided object.\n * @param container an
object that may be a `Tensor` or may directly contain\n * `Tensor`s, such as a `Tensor[]` or `{key: Tensor, ...}`. In

```



general it is safe to pass any object here, except that `Promise`s are not supported. @returns An array of `Tensors` found within the passed object. If the argument is simply a `Tensor`, a list containing that `Tensor` is returned. If the object is not a `Tensor` or does not contain `Tensors`, an empty list is returned.

```

export function getTensorsInContainer(result: TensorContainer): Tensor[] {
 const list: Tensor[] = [];
 const seen = new Set<{}>();
 walkTensorContainer(result, list, seen);
 return list;
}

function walkTensorContainer(
 container: TensorContainer, list: Tensor[], seen: Set<{}>): void {
 if (container == null) {
 return;
 }
 if (container instanceof Tensor) {
 list.push(container);
 return;
 }
 if (!Iterable(container)) {
 return;
 }
 // Iteration over keys works also for arrays.
 const iterable = container as TensorContainerArray;
 for (const k in iterable) {
 const val = iterable[k];
 if (!seen.has(val)) {
 seen.add(val);
 walkTensorContainer(val, list, seen);
 }
 }
}

function isIterable(obj: any): boolean {
 return Array.isArray(obj) || typeof obj === 'object';
}

```

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```

import { BackendTimingInfo, DataMover, KernelBackend } from './backends/backend';
import { Environment, setEnvironmentGlobal } from './environment';
import { getGlobalNamespace } from './global_util';
import { Add, Cast, Identity } from './kernel_names';
import { getGradient, getKernel, getKernelsForBackend, GradFunc, NamedAttrMap, TensorInfo } from './kernel_registry';
import { KernelProfile, Profiler } from './profiler';
import { backpropagateGradients, getFilteredNodesXToY, TapeNode } from './tape';
import { DataId, setTensorTracker, Tensor, TensorTracker, Variable } from './tensor';
import { GradSaveFunc, NamedTensorMap, NamedVariableMap, TensorContainer } from './tensor_types';
import { getTensorsInContainer } from './tensor_util';
import { BackendValues, DataType, DataValues } from './types';
import * as util from './util';
import { bytesFromStringArray, makeOnesTypedArray, now, sizeFromShape } from './util';

/** A function that computes an output. The save function is for saving tensors computed in the forward pass, that we need in the backward pass.
export type ForwardFunc<T> = (backend: KernelBackend, save?: GradSaveFunc) => T;

@docalias (a: Tensor, b: Tensor, ..., save?: Function) => { value: Tensor, gradFunc: (dy: Tensor, saved?: NamedTensorMap) => Tensor | Tensor[] }

export type CustomGradientFunc<T extends Tensor> = (...inputs: Array<Tensor|GradSaveFunc>) => { value: T, gradFunc: (dy: T, saved: Tensor[]) => Tensor | Tensor[] };

export type MemoryInfo = { numTensors: number; numDataBuffers: number; numBytes: number; unreliable?: boolean; reasons: string[] };

type KernelInfo = { name: string; bytesAdded: number; totalBytesSnapshot: number; tensorsAdded: number; totalTensorsSnapshot: number; inputShapes: number[][]; outputShapes: number[][]; kernelTimeMs: number | { error: string } | Promise<number|{error: string}>; extraInfo: string | Promise<string> };

export type ProfileInfo = { newBytes: number; newTensors: number; peakBytes: number; kernels: KernelInfo[]; result: TensorContainer; kernelNames: string[] };

export interface TimingInfo extends BackendTimingInfo { wallMs: number; }

@docalias Function

export type ScopeFn<T extends TensorContainer> = () => T;

interface ScopeState { track: Tensor[]; name: string; id: number; }

interface RegisteredKernelInvocation<I extends NamedTensorMap> { kernelName: string; inputs: I; attrs?: NamedAttrMap; }

interface CustomGradKernelInvocation<T extends Tensor|Tensor[], I extends NamedTensorMap> { forwardFunc: ForwardFunc<T>; backwardsFunc: (dy: T, saved: Tensor[]) => { [P in keyof I]: () => I[P] }; inputs: I; attrs?: NamedAttrMap; }

function isRegisteredKernelInvocation<T extends Tensor|Tensor[], I extends NamedTensorMap>(kernelInvocation: RegisteredKernelInvocation<I> | CustomGradKernelInvocation<T, I>): kernelInvocation is RegisteredKernelInvocation<I> {
 return (kernelInvocation as

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RegisteredKernelInvocation<I>.kernelName != null;\n}\n\nclass EngineState {\n // Public since optimizers will
use it.\n registeredVariables: NamedVariableMap = {};\n\n nextTapeNodeId = 0;\n numBytes = 0;\n numTensors
= 0;\n numStringTensors = 0;\n numDataBuffers = 0;\n\n activeTape: TapeNode[];\n // Number of nested tf.grad()
statements when computing higher-order\n // gradients. E.g. `1` for first-order gradients and `2` for second-order\n
// gradients. Used to track if the tape should be removed after a backprop.\n gradientDepth = 0;\n // Number of
nested kernel calls. When kernel depth is greater than 1, we turn\n // off the tape.\n kernelDepth = 0;\n // Keep
Tensors that parallel the tapes.\n activeScope: ScopeState;\n scopeStack: ScopeState[] = [];\n /**\n * Keeps track
of the number of data moves during a kernel execution. We\n * maintain a stack since kernels can call other
kernels, recursively.\n */\n numDataMovesStack: number[] = [];\n nextScopeId = 0;\n\n tensorInfo = new
WeakMap<DataId, {\n backend: KernelBackend,\n bytes: number,\n dtype: DataType,\n shape: number[]\n
}>();\n\n profiling = false;\n activeProfile: ProfileInfo = {\n newBytes: 0,\n newTensors: 0,\n peakBytes: 0,\n
kernels: [],\n result: null,\n get kernelNames():\n string[] {\n return Array.from(new
Set(this.kernels.map(k => k.name));\n };\n\n dispose() {\n for (const variableName in
this.registeredVariables) {\n this.registeredVariables[variableName].dispose();\n }\n }\n}\n\nexport class
Engine implements TensorTracker, DataMover {\n state: EngineState;\n backendName: string;\n registry: {[id:
string]: KernelBackend} = {};\n registryFactory: {\n [id: string]: {\n factory: () => KernelBackend |
Promise<KernelBackend>,\n priority: number\n };\n } = {};\n\n private profiler: Profiler;\n private
backendInstance: KernelBackend;\n private pendingBackendInit: Promise<boolean>;\n private
pendingBackendInitId = 0;\n\n constructor(public ENV: Environment) {\n this.state = new EngineState();\n }\n\n
async ready(): Promise<void> {\n if (this.pendingBackendInit != null) {\n return
this.pendingBackendInit.then(() => {});\n }\n if (this.backendInstance != null) {\n return;\n }\n const
sortedBackends = this.getSortedBackends();\n\n for (let i = 0; i < sortedBackends.length; i++) {\n const
backendName = sortedBackends[i];\n const success = await this.initializeBackend(backendName).success;\n
if (success) {\n await this.setBackend(backendName);\n return;\n }\n }\n\n throw new Error(\n
`Could not initialize any backends, all backend initializations ` +\n `failed.`);\n }\n\n get backend():
KernelBackend {\n if (this.pendingBackendInit != null) {\n throw new Error(\n `Backend
'${this.backendName}' has not yet been initialized. Make ` +\n `sure to await tf.ready() or await
tf.setBackend() before calling ` +\n `other methods`);\n }\n if (this.backendInstance == null) {\n const
{name, asyncInit} = this.initializeBackendsAndReturnBest();\n if (asyncInit) {\n throw new Error(\n
`The highest priority backend '${name}' has not yet been ` +\n `initialized. Make sure to await tf.ready() or `
+\n `await tf.setBackend() before calling other methods`);\n }\n this.setBackend(name);\n }\n return
this.backendInstance;\n }\n\n backendNames(): string[] {\n return Object.keys(this.registryFactory);\n }\n\n
findBackend(backendName: string): KernelBackend {\n if (!(backendName in this.registry)) {\n // If the
backend hasn't been initialized but we have a registry entry for\n // it, initialize it and return it.\n if
(backendName in this.registryFactory) {\n const {asyncInit} = this.initializeBackend(backendName);\n if
(asyncInit) {\n // Backend is not ready yet.\n return null;\n }\n } else {\n return null;\n }\n }\n
return this.registry[backendName];\n }\n\n findBackendFactory(backendName: string):\n () =>
KernelBackend | Promise<KernelBackend> {\n if (!(backendName in this.registryFactory)) {\n return null;\n
}\n return this.registryFactory[backendName].factory;\n }\n\n registerBackend(\n backendName: string,\n
factory: () => KernelBackend | Promise<KernelBackend>,\n priority = 1): boolean {\n if (backendName in
this.registryFactory) {\n console.warn(\n ` ${backendName} backend was already registered. ` +\n
`Reusing existing backend factory.`);\n return false;\n }\n this.registryFactory[backendName] = {factory,
priority};\n return true;\n }\n\n async setBackend(backendName: string): Promise<boolean> {\n if
(this.registryFactory[backendName] == null) {\n throw new Error(`Backend name '${backendName}' not found
in registry`);\n }\n this.backendName = backendName;\n if (this.registry[backendName] == null) {\n
this.backendInstance = null;\n const {success, asyncInit} = this.initializeBackend(backendName);\n const
result = asyncInit ? await success : success;\n if (!result) {\n return false;\n }\n }\n
this.backendInstance = this.registry[backendName];\n this.setupRegisteredKernels();\n // Reset the profiler.\n

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this.profiler = new Profiler(this.backendInstance);\n\n return true;\n }\n\n private setupRegisteredKernels(): void
{\n const kernels = getKernelsForBackend(this.backendName);\n kernels.forEach(kernel => {\n if
(kernel.setupFunc != null) {\n kernel.setupFunc(this.backendInstance);\n }\n });\n}\n\n private
disposeRegisteredKernels(backendName: string): void {\n const kernels =
getKernelsForBackend(backendName);\n kernels.forEach(kernel => {\n if (kernel.disposeFunc != null) {\n
kernel.disposeFunc(this.registry[backendName]);\n }\n });\n}\n\n /**\n * Initializes a backend by looking
up the backend name in the factory\n * registry and calling the factory method. Returns a boolean representing\n *
whether the initialization of the backend succeeded. Throws an error if\n * there is no backend in the factory
registry.\n */\n private initializeBackend(backendName: string):\n { success: boolean|Promise<boolean>,
asyncInit: boolean } {\n const registryFactoryEntry = this.registryFactory[backendName];\n if
(registryFactoryEntry == null) {\n throw new Error(\n `Cannot initialize backend ${backendName}, no
registration found.`);\n }\n\n try {\n const backend = registryFactoryEntry.factory();\n /* Test if the
factory returns a promise.\n Done in a more liberal way than\n previous
'Promise.resolve(backend)===backend'\n as we needed to account for custom Promise\n implementations
(e.g. Angular) */\n if (backend && !(backend instanceof KernelBackend) &&\n typeof backend.then ===
'function') {\n const promiseId = ++this.pendingBackendInitId;\n const success =\n backend\n
.then(backendInstance => {\n // Outdated promise. Another backend was set in the meantime.\n
if (promiseId < this.pendingBackendInitId) {\n return false;\n }\n
this.registry[backendName] = backendInstance;\n this.pendingBackendInit = null;\n return
true;\n })\n .catch(err => {\n // Outdated promise. Another backend was set in the
meantime.\n if (promiseId < this.pendingBackendInitId) {\n return false;\n }\n
this.pendingBackendInit = null;\n console.warn(\n `Initialization of backend
${backendName} failed`);\n console.warn(err.stack || err.message);\n return false;\n
 });\n this.pendingBackendInit = success;\n return { success, asyncInit: true }; }\n } else {\n
this.registry[backendName] = backend as KernelBackend;\n return { success: true, asyncInit: false }; }\n }\n
}\n catch (err) {\n console.warn(`Initialization of backend ${backendName} failed`);\n console.warn(err.stack ||
err.message);\n return { success: false, asyncInit: false }; }\n }\n}\n\n removeBackend(backendName: string):
void {\n if (!(backendName in this.registryFactory)) {\n throw new Error(`${backendName} backend not found
in registry`);\n }\n if (this.backendName === backendName && this.pendingBackendInit != null) {\n //
There is a pending promise of the backend we want to remove. Make it\n // obsolete.\n
this.pendingBackendInitId++;\n }\n\n if (backendName in this.registry) {\n
this.disposeRegisteredKernels(backendName);\n this.registry[backendName].dispose();\n delete
this.registry[backendName];\n }\n\n delete this.registryFactory[backendName];\n\n // Unset the backend if it is
active.\n if (this.backendName === backendName) {\n this.pendingBackendInit = null;\n this.backendName
= null;\n this.backendInstance = null;\n }\n}\n\n private getSortedBackends(): string[] {\n if
(Object.keys(this.registryFactory).length === 0) {\n throw new Error('No backend found in registry.);\n }\n
return Object.keys(this.registryFactory).sort((a: string, b: string) => {\n // Highest priority comes first.\n
return
this.registryFactory[b].priority -\n this.registryFactory[a].priority;\n });\n}\n\n private
initializeBackendsAndReturnBest():\n { name: string, asyncInit: boolean } {\n const sortedBackends =
this.getSortedBackends();\n\n for (let i = 0; i < sortedBackends.length; i++) {\n const backendName =
sortedBackends[i];\n const { success, asyncInit } = this.initializeBackend(backendName);\n if (asyncInit ||
success) {\n return { name: backendName, asyncInit};\n }\n }\n\n throw new Error(\n `Could not
initialize any backends, all backend initializations ` +\n `failed.`);\n}\n\n moveData(backend: KernelBackend,
dataId: DataId) {\n const info = this.state.tensorInfo.get(dataId);\n const srcBackend = info.backend;\n const
values = this.readSync(dataId);\n const refCount = srcBackend.refCount(dataId);\n // Delete the tensor from the
old backend and move it to the new\n // backend.\n srcBackend.disposeData(dataId, true);\n info.backend =
backend;\n backend.move(dataId, values, info.shape, info.dtype, refCount);\n if
(this.shouldCheckForMemLeaks()) {\n // Track the number of moves during a kernel execution to correctly\n

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// detect memory leaks.\n this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1]++; \n
}\n\n tidy<T extends TensorContainer>(nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>):\n T {\n let name:\n string = null;\n if (fn == null) {\n // Called with only 1 argument.\n if (typeof nameOrFn !== 'function') {\n throw new Error('Please provide a function to tidy());\n }\n fn = nameOrFn;\n } else {\n // Called with\n 2 arguments.\n if (typeof nameOrFn !== 'string' && !(nameOrFn instanceof String)) {\n throw new Error(\n 'When calling with two arguments, the first argument '\n +\n 'to tidy() must be a string');\n }\n if\n (typeof fn !== 'function') {\n throw new Error(\n 'When calling with two arguments, the 2nd argument '\n +\n 'to tidy() must be a function');\n }\n name = nameOrFn as string;\n // TODO(nsthorat,smilkov):\n Do operation logging and performance\n // profiling.\n }\n let result: T;\n return this.scopedRun(\n ()\n => this.startScope(name), () => this.endScope(result), () => {\n result = fn();\n if (result instanceof\n Promise) {\n console.error('Cannot return a Promise inside of tidy.);\n }\n return result;\n });\n}\n\n private scopedRun<T>(start: () => void, end: () => void, f: () => T): T {\n start();\n try {\n const\n res = f();\n end();\n return res;\n } catch (ex) {\n end();\n throw ex;\n }\n}\n\n private static\n nextTensorId = 0;\n private nextTensorId(): number {\n return Engine.nextTensorId++;\n }\n\n private static\n nextVariableId = 0;\n private nextVariableId(): number {\n return Engine.nextVariableId++;\n }\n\n /**\n *\n This method is called instead of the public-facing tensor.clone() when\n *\n saving a tensor for backwards pass. It\n makes sure to add the clone\n *\n operation to the tape regardless of being called inside a kernel\n *\n execution.\n */\n private clone(x: Tensor): Tensor {\n const y: Tensor = ENGINE.runKernel(Identity, {x} as {\n as\n NamedTensorMap});\n const inputs = {x};\n const grad = (dy: Tensor) => ({\n x: () => {\n const dtype =\n 'float32';\n const gradInputs = {x: dy};\n const attrs = {dtype};\n return ENGINE.runKernel(\n Cast, gradInputs as {\n as\n NamedTensorMap},\n // tslint:disable-next-line: no-unnecessary-type-\n assertion\n attrs as {\n as\n NamedAttrMap}) as Tensor;\n }\n });\n const saved: Tensor[] = [];\n this.addTapeNode(this.state.activeScope.name, inputs, [y], grad, saved, {});\n return y;\n }\n\n /**\n *\n Execute\n a kernel with the given name and return the output tensor.\n */\n * @param kernelName The name of the kernel to\n execute.\n * @param inputs A map of input names to tensors.\n * @param attrs A map of attribute names to their\n values. An attribute is a\n * primitive (non-tensor) input to the kernel.\n * @param inputsToSave A list of\n tensors, inputs to save for the backprop\n * computation.\n * @param outputsToSave A list of booleans,\n specifying which output to save\n * for the backprop computation. These are booleans since the output\n * tensors are not visible to the user.\n */\n runKernel<T extends Tensor|Tensor[]>(kernelName: string, inputs:\n NamedTensorMap, attrs?: NamedAttrMap): T {\n const hasKernel = getKernel(kernelName, this.backendName)\n != null;\n if (!hasKernel) {\n throw new Error(`Kernel '${kernelName}' not registered for backend '${\n this.backendName}'`);\n }\n return this.runKernelFunc({kernelName, inputs, attrs});\n }\n\n private\n shouldCheckForMemLeaks(): boolean {\n return this.ENV.getBool('IS_TEST');\n }\n\n private\n checkKernelForMemLeak(kernelName: string, numDataIdsBefore: number,\n outInfos: TensorInfo[]): void {\n const numDataIdsAfter = this.backend.numDataIds();\n // Count the number of data ids associated with the\n result of the kernel.\n let numOutputDataIds = 0;\n outInfos.forEach(info => {\n // Complex numbers allocate\n 3 data ids, one for 'real', one for\n // 'imaginary', and one for the container that holds the former two.\n numOutputDataIds += (info.dtype === 'complex64' ? 3 : 1);\n });\n // Account for the number of moves during\n kernel execution. A "data move"\n // can happen in the middle of a kernel execution, placing a new (key,value)\n // pair in the data storage. Since data moves have net zero effect (we\n // always remove the data from the old\n backend), we have to cancel them out\n // when detecting memory leaks.\n const numMoves =\n this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1];\n const dataIdsLeaked =\n numDataIdsAfter - numDataIdsBefore - numOutputDataIds - numMoves;\n if (dataIdsLeaked > 0) {\n throw\n new Error(\n `Backend '${this.backendName}' has an internal memory leak ` +\n `(${dataIdsLeaked}\n data ids) after running '${kernelName}'`);\n }\n }\n\n /**\n *\n Internal helper method to execute a kernel Func\n */\n * Use `runKernel` to execute kernels from outside of engine.\n */\n private runKernelFunc<T extends\n Tensor|Tensor[], I extends NamedTensorMap>(kernelParams: RegisteredKernelInvocation<I>)\n CustomGradKernelInvocation<T, I>): T {\n let outputs: Tensor[];\n let saved: Tensor[] = [];\n const isTapeOn

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= this.isTapeOn();\n\n const startingBytecount = this.state.numBytes;\n const startingNumTensors =
this.state.numTensors;\n\n if (this.shouldCheckForMemLeaks()) {\n this.state.numDataMovesStack.push(0);\n }\n\n let kernelFunc: () => Tensor[];\n if (this.backendName == null) {\n // backend has not been initialized
yet (backend initialization is lazy\n // can be deferred until an op/ kernel is run).\n // The below getter has side
effects that will try to initialize the\n // backend and set properties like this.backendName\n // tslint:disable-
next-line: no-unused-expression\n this.backend;\n }\n\n let out: TensorInfo|TensorInfo[];\n\n const
kernelOrScopeName = isRegisteredKernelInvocation(kernelParams) ?\n kernelParams.kernelName : \n this.state.activeScope != null ? this.state.activeScope.name : '';\n\n // Create the kernelFunc from either a registered
kernel OR passed in\n // forward/backward functions (used by custom grad). In this context a\n // kernelFunc
wraps a kernel implementation with some bookkeeping.\n\n if (isRegisteredKernelInvocation(kernelParams)) {\n
 const {kernelName, inputs, attrs} = kernelParams;\n if (this.backendName == null) {\n // backend has not
been initialized yet (backend initialization is lazy\n // can be deferred until an op/ kernel is run).\n // The
below getter has side effects that will try to initialize the\n // backend and set properties like
this.backendName\n // tslint:disable-next-line: no-unused-expression\n this.backend;\n }\n const
kernel = getKernel(kernelName, this.backendName);\n util.assert(\n kernel != null,\n () => `Cannot
find registered kernel '${kernelName}' for backend '${\n this.backendName}'`);\n\n kernelFunc = () =>
{\n const numDataIdsBefore = this.backend.numDataIds();\n out = kernel.kernelFunc({inputs, attrs,
backend: this.backend});\n const outInfos = Array.isArray(out) ? out : [out];\n if
(this.shouldCheckForMemLeaks()) {\n this.checkKernelForMemLeak(kernelName, numDataIdsBefore,
outInfos);\n }\n const outTensors = outInfos.map((outInfo: TensorInfo|Tensor) => {\n // todo
(yassogba) remove this option (Tensor) when node backend\n // methods have been modularized and they all
return tensorInfo.\n // TensorInfos do not have a rank attribute.\n if ((outInfo as Tensor).rank != null) {\n
 return outInfo as Tensor;\n }\n const {dataId, shape, dtype} = outInfo as TensorInfo;\n return
this.makeTensorFromDataId(dataId, shape, dtype);\n });\n\n // Save any required inputs and outputs.\n\n // Do not save unless we are recording to the tape. Otherwise it would\n // cause a mem leak since there would
be no backprop for these tensors\n // (which would otherwise dispose them).\n if (isTapeOn) {\n const
tensorsToSave =\n this.getTensorsForGradient(kernelName, inputs, outTensors);\n saved =
this.saveTensorsForBackwardMode(tensorsToSave);\n }\n return outTensors;\n }; \n } else {\n
const {forwardFunc} = kernelParams;\n // Running a customGrad op.\n const saveFunc: GradSaveFunc =
(tensors) => {\n // Do not save unless we are recording to the tape. Otherwise it would\n // cause a mem
leak since we would never run backprop, which disposes\n // the kept tensors.\n if (!isTapeOn) {\n
return;\n }\n saved = tensors.map(tensor => this.keep(this.clone(tensor)));\n }; \n\n kernelFunc = () =>
{\n const numDataIdsBefore = this.backend.numDataIds();\n out = this.tidy(() =>
forwardFunc(this.backend, saveFunc));\n const outs = (Array.isArray(out) ? out : [out]) as Tensor[];\n if
(this.shouldCheckForMemLeaks()) {\n // Scope name is used to print a more helpful error message if
needed.\n this.checkKernelForMemLeak(kernelOrScopeName, numDataIdsBefore, outs);\n }\n return
outs;\n }; \n }\n\n // Run the kernelFunc. Optionally profiling it.\n // const {inputs, attrs} =
kernelParams;\n const backwardsFunc = isRegisteredKernelInvocation(kernelParams) ?\n null : \n kernelParams.backwardsFunc;\n\n let kernelProfile: KernelProfile;\n this.scopedRun(\n // Stop recording to
a tape when running a kernel.\n () => this.state.kernelDepth++, () => this.state.kernelDepth--, () => {\n if
(!this.ENV.getBool('DEBUG') && !this.state.profiling) {\n outputs = kernelFunc();\n } else {\n
kernelProfile = this.profiler.profileKernel(\n kernelOrScopeName, inputs, () => kernelFunc());\n if
(this.ENV.getBool('DEBUG')) {\n this.profiler.logKernelProfile(kernelProfile);\n }\n outputs
= kernelProfile.outputs;\n }); \n\n if (isTapeOn) {\n this.addTapeNode(\n
kernelOrScopeName, inputs, outputs, backwardsFunc, saved, attrs);\n }\n\n if (this.state.profiling) {\n
this.state.activeProfile.kernels.push({\n name: kernelOrScopeName,\n bytesAdded: this.state.numBytes -
startingBytecount,\n totalBytesSnapshot: this.state.numBytes,\n tensorsAdded: this.state.numTensors -
startingNumTensors,\n totalTensorsSnapshot: this.state.numTensors,\n inputShapes:

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Object.keys(inputs).map(\n key => inputs[key] != null ? inputs[key].shape : null),\n outputShapes:
outputs.map(item => item.shape),\n kernelTimeMs: kernelProfile.timeMs,\n extraInfo:
kernelProfile.extraInfo\n });\n }\n return (Array.isArray(out) ? outputs : outputs[0]) as T;\n }\n\n /**\n *
Saves tensors used in forward mode for use in backward mode.\n * @param tensors the list of tensors to
save.\n *\n private saveTensorsForBackwardMode(tensors: Tensor[]): Tensor[] {\n const saved =
tensors.map(tensor => this.keep(this.clone(tensor))); \n return saved;\n }\n\n /**\n * Returns a list of tensors to
save for a given gradient calculation.\n * @param kernelName name of kernel to look up gradient for.\n *
@param inputs a map of input tensors.\n * @param outputs an array of output tensors from forward mode of
kernel.\n *\n private getTensorsForGradient(\n kernelName: string, inputs: NamedTensorMap,\n outputs:
Tensor[]): Tensor[]|null {\n const gradConfig = getGradient(kernelName);\n if (gradConfig != null) {\n const
inputsToSave: string[] = gradConfig.inputsToSave || [];\n const outputsToSave: boolean[] =
gradConfig.outputsToSave || [];\n\n // If saveAllInputs is true, all inputs will be saved. Otherwise, inputs\n //
specified in inputsToSave will be saved.\n let inputTensorsToSave: Tensor[];\n if (gradConfig.saveAllInputs)
{\n util.assert(\n Array.isArray(inputs),\n () => 'saveAllInputs is true, expected inputs to be an
array.');

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the\n // backend.\n // TODO(pyu10055): This is currently used by makeVariable method, to increase\n // refCount
on the backend for the dataId. It can potentially be replaced with\n // Identity op instead of calling backend
directly.\n incRef(a: Tensor, backend: KernelBackend): void {\n this.trackTensor(a, backend);\n this.backend.incRef(a.dataId);\n }\n\n removeDataId(dataId: DataId, backend: KernelBackend) {\n if
(this.state.tensorInfo.has(dataId) &&\n this.state.tensorInfo.get(dataId).backend === backend) {\n
this.state.tensorInfo.delete(dataId);\n this.state.numDataBuffers--;\n }\n }\n\n disposeTensor(a: Tensor): void
{\n if (!this.state.tensorInfo.has(a.dataId)) {\n return;\n }\n const info =
this.state.tensorInfo.get(a.dataId);\n this.state.numTensors--;\n if (a.dtype === 'string') {\n
this.state.numStringTensors--;\n this.state.numBytes -= info.bytes;\n }\n // Don't count bytes for complex
numbers as they are counted by their\n // components.\n if (a.dtype !== 'complex64' && a.dtype !== 'string') {\n
 const bytes = a.size * util.bytesPerElement(a.dtype);\n this.state.numBytes -= bytes;\n }\n }\n // Remove the
reference to dataId if backend dispose the data successfully\n if (info.backend.disposeData(a.dataId)) {\n
this.removeDataId(a.dataId, info.backend);\n }\n }\n // TODO(nsthorat): Construct an error and save the stack
trace for\n // debugging when in debug mode. Creating a stack trace is too expensive\n // to do unconditionally.\n }\n }\n\n disposeVariables(): void {\n for (const varName in this.state.registeredVariables) {\n const v =
this.state.registeredVariables[varName];\n this.disposeVariable(v);\n }\n }\n\n disposeVariable(v: Variable):
void {\n this.disposeTensor(v);\n if (this.state.registeredVariables[v.name] != null) {\n delete
this.state.registeredVariables[v.name];\n }\n }\n\n memory(): MemoryInfo {\n const info =
this.backend.memory() as MemoryInfo;\n info.numTensors = this.state.numTensors;\n info.numDataBuffers =
this.state.numDataBuffers;\n info.numBytes = this.state.numBytes;\n if (this.state.numStringTensors > 0) {\n
info.unreliable = true;\n if (info.reasons === null) {\n info.reasons = [];\n }\n info.reasons.push(\n
'Memory usage by string tensors is approximate ' +\n '(2 bytes per character)');\n }\n return info;\n }\n }\n\n async profile(query: () => (TensorContainer | Promise<TensorContainer>)):\n Promise<ProfileInfo> {\n
this.state.profiling = true;\n\n const startBytes = this.state.numBytes;\n const startNumTensors =
this.state.numTensors;\n\n this.state.activeProfile.kernels = [];\n this.state.activeProfile.result = await
query();\n\n this.state.profiling = false;\n\n this.state.activeProfile.peakBytes = Math.max(\n
...this.state.activeProfile.kernels.map(d => d.totalBytesSnapshot));\n this.state.activeProfile.newBytes =
this.state.numBytes - startBytes;\n this.state.activeProfile.newTensors =\n this.state.numTensors -
startNumTensors;\n for (const kernel of this.state.activeProfile.kernels) {\n kernel.kernelTimeMs = await
kernel.kernelTimeMs;\n kernel.extraInfo = await kernel.extraInfo;\n }\n return this.state.activeProfile;\n }\n }\n\n isTapeOn(): boolean {\n return this.state.gradientDepth > 0 && this.state.kernelDepth === 0;\n }\n }\n\n private addTapeNode(\n kernelName: string, inputs: NamedTensorMap, outputs: Tensor[],\n gradientsFunc: GradFunc, saved: Tensor[], attrs: NamedAttrMap): void {\n const tapeNode: TapeNode =\n {id:
this.state.nextTapeNodeId++, kernelName, inputs, outputs, saved};\n\n const gradConfig =
getGradient(kernelName);\n if (gradConfig != null) {\n gradientsFunc = gradConfig.gradFunc;\n }\n if
(gradientsFunc != null) {\n tapeNode.gradient = (dys: Tensor[]) => {\n // TODO(smilkov): To optimize
back-prop, pass dys that are not used in\n // the backprop graph to the user as null instead of zeros\n dys =
dys.map((dy, i) => {\n if (dy == null) {\n const output = outputs[i];\n const vals =
util.makeZerosTypedArray(output.size, output.dtype);\n return this.makeTensor(vals, output.shape,
output.dtype);\n }\n return dy;\n });\n // Grad functions of ops with single outputs expect a dy,
while ops\n // with multiple outputs expect dys (array of dy).\n return gradientsFunc(dys.length > 1 ? dys :
dys[0], saved, attrs);\n }; \n }\n this.state.activeTape.push(tapeNode);\n }\n }\n\n keep<T extends
Tensor>(result: T): T {\n result.kept = true;\n return result;\n }\n\n private startTape() {\n if
(this.state.gradientDepth === 0) {\n this.state.activeTape = [];\n }\n this.state.gradientDepth++;\n }\n }\n\n private endTape() {\n this.state.gradientDepth--;\n }\n }\n\n /**\n * Start a scope. Use this with endScope() to
achieve the same functionality\n * as scope() without the need for a function closure.\n */\n startScope(name?:
string) {\n const scopeInfo: ScopeState = {\n track: [],\n name: 'unnamed scope',\n id:
this.state.nextScopeId++\n }; \n if (name) {\n scopeInfo.name = name;\n }\n }\n }\n }

```

```

this.state.scopeStack.push(scopeInfo);\n this.state.activeScope = scopeInfo;\n }\n\n /**\n * End a scope. Use this with startScope() to achieve the same functionality\n * as scope() without the need for a function closure.\n */\n endScope(result?: TensorContainer) {\n const tensorsToTrackInParent = getTensorsInContainer(result);\n const tensorsToTrackInParentSet =\n new Set(tensorsToTrackInParent.map(t => t.id));\n\n // Dispose the arrays tracked in this scope.\n for (let i = 0; i < this.state.activeScope.track.length; i++) {\n const tensor = this.state.activeScope.track[i];\n if (!tensor.kept && !tensorsToTrackInParentSet.has(tensor.id)) {\n tensor.dispose();\n }\n }\n\n const oldScope = this.state.scopeStack.pop();\n this.state.activeScope = this.state.scopeStack.length === 0 ?\n null :\n this.state.scopeStack[this.state.scopeStack.length - 1];\n\n // Track the current result in the parent scope.\n tensorsToTrackInParent.forEach(tensor => {\n // Only track the tensor if was allocated in the inner scope and is not\n // globally kept.\n if (!tensor.kept && tensor.scopedId === oldScope.id) {\n this.track(tensor);\n }\n });\n\n /**\n * Returns gradients of `f` with respect to each of the `xs`. The gradients\n * returned are of the same length as `xs`, but some might be null if `f`\n * was not a function of that `x`. It also takes optional dy to multiply the\n * gradient, which defaults to `1`.\n */\n gradients<T extends Tensor>(\n f: () => T, xs: Tensor[], dy?: T,\n allowNoGradients = false): {value: T, grads: Tensor[]} {\n util.assert(\n xs.length > 0, () => 'gradients() received an empty list of xs.);\n if (dy !== null && dy.dtype !== 'float32') {\n throw new Error(`dy must have 'float32' dtype, but has '${dy.dtype}'`);\n }\n\n const y = this.scopedRun(\n () => this.startTape(), () => this.endTape(),\n () => this.tidy('forward', f));\n util.assert(\n y instanceof Tensor,\n () => 'The result y returned by f() must be a tensor.);\n // Filter out the nodes that don't connect x => y.\n const filteredTape = getFilteredNodesXToY(this.state.activeTape,\n xs, y);\n if (!allowNoGradients && filteredTape.length === 0 && xs.length > 0) {\n throw new Error(\n 'Cannot compute gradient of y=f(x) with respect to x. Make sure '+\n 'that the f you passed encloses all operations that lead from x '+\n 'to y.);\n }\n\n return this.tidy('backward', () => {\n const accumulatedGradientMap: {[tensorId: number]: Tensor} = {};\n accumulatedGradientMap[y.id] = (dy == null) ?\n ones(y.shape) : dy;\n\n // Backprop gradients through the filtered nodes.\n backpropagateGradients(\n accumulatedGradientMap, filteredTape,\n // Pass the tidy function to avoid circular dep with `tape.ts`.\n f\n => this.tidy(f as ScopeFn<Tensor>),\n // Pass an add function to avoid a circular dep with `tape.ts`.\n add);\n const grads = xs.map(x => accumulatedGradientMap[x.id]);\n\n if (this.state.gradientDepth === 0) {\n // This means that we are not computing higher-order gradients\n // and can clean up the tape.\n this.state.activeTape.forEach(node => {\n for (const tensor of node.saved) {\n tensor.dispose();\n }\n });\n this.state.activeTape = null;\n }\n\n return {value: y, grads};\n });\n }\n\n customGrad<T extends Tensor>(\n f: CustomGradientFunc<T>):\n (...args: Array<Tensor|GradSaveFunc>) => T {\n util.assert(\n util.isFunction(f),\n () => 'The f passed in customGrad(f) must be a function.);\n return (...inputs: Tensor[]): T => {\n util.assert(\n inputs.every(t => t instanceof Tensor),\n () => 'The args passed in customGrad(f)(x1, x2,...) must all be '+\n 'tensors');\n\n let res: {\n value: T,\n gradFunc: (dy: T, saved: Tensor[]) => Tensor | Tensor[],\n }; \n const inputMap: NamedTensorMap = {};\n inputs.forEach((input, i) => {\n inputMap[i] = input;\n });\n const forwardFunc: ForwardFunc<T> = (\n save) => {\n res = f(...inputs, save);\n util.assert(\n res.value instanceof Tensor,\n () => 'The function f passed in customGrad(f) must return an '+\n 'object where `obj.value` is a tensor');\n util.assert(\n util.isFunction(res.gradFunc),\n () => 'The function f passed in customGrad(f) must return an '+\n 'object where `obj.gradFunc` is a function.);\n return res.value;\n }; \n const backwardsFunc = (dy: T, saved: Tensor[]) => {\n const gradRes = res.gradFunc(dy, saved);\n const grads: Tensor[] = Array.isArray(gradRes) ? gradRes : [gradRes];\n util.assert(\n grads.length === inputs.length,\n () => 'The function f passed in customGrad(f) must return an '+\n 'object where `obj.gradFunc` is a function that returns '+\n 'the same number of tensors as inputs passed to f(...).);\n util.assert(\n grads.every(t => t instanceof Tensor),\n () => 'The function f passed in customGrad(f) must return an '+\n 'object where `obj.gradFunc` is a function that returns '+\n 'a list of only tensors.);\n const gradMap: {[key: string]: () => Tensor} = {};\n grads.forEach((grad, i) => {\n gradMap[i] = () => grad;\n });\n return gradMap;\n }; \n return this.runKernelFunc({\n
```



```

forwardFunc,\n backwardsFunc,\n inputs: inputMap,\n });\n });\n\n readSync(dataId: DataId): BackendValues {\n // Route the read to the correct backend.\n const info = this.state.tensorInfo.get(dataId);\n return info.backend.readSync(dataId);\n }\n read(dataId: DataId): Promise<BackendValues> {\n // Route the read to the correct backend.\n const info = this.state.tensorInfo.get(dataId);\n return info.backend.read(dataId);\n }\n\n async time(query: () => void): Promise<TimingInfo> {\n const start = now();\n const timingInfo = await this.backend.time(query) as TimingInfo;\n timingInfo.wallMs = now() - start;\n return timingInfo;\n }\n\n /**\n * Tracks a Tensor in the current scope to be automatically cleaned up\n * when the current scope ends, and returns the value.\n * @param result The Tensor to track in the current scope.\n */\n private track<T extends Tensor>(result: T): T {\n if (this.state.activeScope != null) {\n result.scopeId = this.state.activeScope.id;\n this.state.activeScope.track.push(result);\n }\n return result;\n }\n\n get registeredVariables(): NamedVariableMap {\n return this.state.registeredVariables;\n }\n\n /**\n * Resets the engine state. Removes all backends but does not remove\n * registered backend factories.\n */\n reset(): void {\n // Make any pending promise obsolete.\n this.pendingBackendInitId++;\n\n this.state.dispose();\n this.ENV.reset();\n this.state = new EngineState();\n\n for (const backendName in this.registry) {\n this.disposeRegisteredKernels(backendName);\n this.registry[backendName].dispose();\n delete this.registry[backendName];\n }\n this.backendName = null;\n this.backendInstance = null;\n this.pendingBackendInit = null;\n }\n\n function ones(shape: number[]): Tensor {\n const values = makeOnesTypedArray(sizeFromShape(shape), 'float32');\n return ENGINE.makeTensor(values, shape, 'float32');\n }\n\n export function getOrMakeEngine(): Engine {\n const ns = getGlobalNamespace() as { _tfengine: Engine };\n if (ns._tfengine == null) {\n const environment = new Environment(ns);\n ns._tfengine = new Engine(environment);\n }\n setEnvironmentGlobal(ns._tfengine.ENV);\n\n // Tell the current tensor interface that the global engine is responsible\n // for tracking.\n setTensorTracker(() => ns._tfengine);\n return ns._tfengine;\n }\n\n export const ENGINE = getOrMakeEngine();\n\n /**\n * A implementation of the add op for use within engine and tape.\n * This allows us to avoid a circular dependency between add.ts and engine.\n * It is exported to be available in tape tests.\n */\n export function add(a: Tensor, b: Tensor): Tensor {\n // We duplicate Add here to avoid a circular dependency with add.ts.\n const inputs = {a, b};\n return ENGINE.runKernel(Add, inputs as { } as NamedTensorMap);\n }\n\n /**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n =====\n\n /**\n * tslint:disable-next-line:no-any\n */\n function _isNavigatorDefined(): boolean {\n return typeof navigator !== 'undefined' && navigator != null;\n }\n\n /**\n * tslint:disable-next-line:no-any\n */\n const a = navigator.userAgent || navigator.vendor || (window as any).opera;\n\n /**\n * tslint:disable-next-line:max-line-length\n */\n return /(\n (android|bb|d+meego).+mobile|avantgo|bada\b|blackberry|blazer|compal|elaine|fennec|hiptop|iemo|ip(hone|od)|iris|kindle|lge |maemo|midp|mmp|mobile.+firefox|netfront|opera m(ob|in)i|palm(\n os)?|phone|p(ixi|re)\b|plucker|pocket|psp|series(4|6|0)|symbian|treo|up\.(browser|link)|vodafone|wap|windows ce|xda|xiino|\n .test(a) ||\n // tslint:disable-next-line:max-line-length\n /1207|6310|6590|3gso|4thp|50[1-6]|i770s|802s|a wa|abac|ac(er|oo|s|-)\n)ai(ko|rn)|al(av|ca|co)|amoi|an(ex|ny|yw)|aptu|ar(ch|go)|as(te|us)|attw|au(di|-m|r |s\n)avan|be(ck|ll|nq)|bi(lb|rd)|bl(ac|az)|br(e|v)w|bumb|bw\-(n|u)c55|capi|ccwa|cdm\|-|cell|chtm|cldc|cmd\|-|co(mp|nd)|craw|da(it|ll|ng)|dbte|dc\|-s|devi|dica|dmob|do(c|p)|ods(12|-d)|el(49|ai)|em(12|ul)|er(ic|k0)|esl8|ez([4-7]0|os|wa|ze)|fetc|fly\(-|_)|g1 u|g560|gene|gf|-5|g\|-mo|go\(|w|od)|gr(ad|un)|haie|hcat|hd\-(m|p|t)|hei\|-|hi(pt|ta)|hp(\n i|ip)|hs\|-|ht(c\(-|_|a|g|p|s|t)|tp)|hu(aw|tc)|i\-(20|go|ma)|i230|iac(|\n

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|your|zeto|zte|\\-|i|n .test(a.substr(0, 4));\\n }\\n return false;\\n}\\n\\nexport function isBrowser(): boolean {\\n
return (typeof window !== 'undefined' && window.document !== null) ||\\n //@ts-ignore\\n (typeof
WorkerGlobalScope !== 'undefined');\\n}\\n}\\n","/*\\n * @license\\n * Copyright 2019 Google LLC. All Rights
Reserved.\\n * Licensed under the Apache License, Version 2.0 (the \"License\");\\n * you may not use this file
except in compliance with the License.\\n * You may obtain a copy of the License at\\n *\\n *
http://www.apache.org/licenses/LICENSE-2.0\\n *\\n * Unless required by applicable law or agreed to in writing,
software\\n * distributed under the License is distributed on an \"AS IS\" BASIS,\\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\\n * See the License for the specific language
governing permissions and\\n * limitations under the License.\\n *
```

```
====\\n
*\\nimport './engine';\\n\\nimport * as device_util from './device_util';\\nimport {env} from './environment';\\nconst
ENV = env();\\n\\n/*\\n * This file contains environment-related flag registrations.\\n *\\n/* Whether to enable
debug mode. *\\nENV.registerFlag('DEBUG', () => false, debugValue => {\\n if (debugValue) {\\n
console.warn(\\n 'Debugging mode is ON. The output of every math call will ' +\\n 'be downloaded to CPU
and checked for NaNs.' +\\n 'This significantly impacts performance.');
```

```
====\\n
*\\nimport {ENGINE} from './engine';\\nimport {env} from './environment';\\nimport {Tensor} from
```

```

./tensor';\nimport {DataType, TensorLike} from './types';\nimport {assert, flatten, inferDtype, isArray,
toTypedArray} from './util';\n\nexport function inferShape(val: TensorLike, dtype?: DataType): number[] {\n
firstElem: typeof val = val;\n\n if (isArray(val)) {\n return dtype === 'string' ? [] : [val.length];\n }\n if
(!Array.isArray(val)) {\n return []; // Scalar.\n }\n const shape: number[] = [];\n\n while
(Array.isArray(firstElem) ||\n isArray(firstElem) && dtype !== 'string') {\n
shape.push(firstElem.length);\n firstElem = firstElem[0];\n }\n if (Array.isArray(val) &&\n
env().getBool('TENSORLIKE_CHECK_SHAPE_CONSISTENCY')) {\n deepAssertShapeConsistency(val,
shape, []);\n }\n\n return shape;\n}\n\nfunction deepAssertShapeConsistency(\n val: TensorLike, shape:
number[], indices: number[]) {\n indices = indices || [];\n if (!Array.isArray(val) && !isArray(val)) {\n
assert(\n shape.length === 0,\n () => `Element arr[${indices.join(',')}] is a primitive, ` +\n `but
should be an array/TypedArray of ${shape[0]} elements`);\n return;\n }\n assert(\n shape.length > 0,\n ()
=> `Element arr[${indices.join(',')}] should be a primitive, ` +\n `but is an array of ${val.length}
elements`);\n assert(\n val.length === shape[0],\n () => `Element arr[${indices.join(',')}] should have
${shape[0]} ` +\n `elements, but has ${val.length} elements`);\n const subShape = shape.slice(1);\n for (let i
= 0; i < val.length; ++i) {\n deepAssertShapeConsistency(val[i], subShape, indices.concat(i));\n }\n}\n\nfunction
assertDtype(\n expectedDtype: DataType|'numeric'|'string_or_numeric',\n actualDtype: DataType, argName:
string, functionName: string) {\n if (expectedDtype === 'string_or_numeric') {\n return;\n }\n if (expectedDtype
=== null) {\n throw new Error(`Expected dtype cannot be null.`);\n }\n if (expectedDtype !== 'numeric' &&
expectedDtype !== actualDtype ||\n expectedDtype === 'numeric' && actualDtype === 'string') {\n throw
new Error(\n `Argument '${argName}' passed to '${functionName}' must ` +\n `be ${expectedDtype}
tensor, but got ${actualDtype} tensor`);\n }\n}\n\nexport function convertToTensor<T extends Tensor>(\n x:
T|TensorLike, argName: string, functionName: string,\n parseAsDtype: DataType|'numeric'|'string_or_numeric' =
'numeric'): T {\n if (x instanceof Tensor) {\n assertDtype(parseAsDtype, x.dtype, argName, functionName);\n
return x;\n }\n let inferredDtype = inferDtype(x);\n // If the user expects a bool/int/float, use that info to update
the\n // inferredDtype when it is not a string.\n if (inferredDtype !== 'string' &&\n ['bool', 'int32',
'float32'].indexOf(parseAsDtype) >= 0) {\n inferredDtype = parseAsDtype as DataType;\n }\n
assertDtype(parseAsDtype, inferredDtype, argName, functionName);\n if ((x === null) ||\n (!isArray(x) &&
!Array.isArray(x) && typeof x !== 'number' &&\n typeof x !== 'boolean' && typeof x !== 'string')) {\n
const type = x === null ? 'null' : (x as {}).constructor.name;\n throw new Error(\n `Argument '${argName}'
passed to '${functionName}' must be a ` +\n `Tensor or TensorLike, but got ${type}`);\n }\n const
inferredShape = inferShape(x, inferredDtype);\n if (!isArray(x) && !Array.isArray(x)) {\n x = [x] as
number[];\n }\n const skipTypedArray = true;\n const values = inferredDtype !== 'string' ?\n toTypedArray(x,
inferredDtype as DataType) :\n flatten(x as string[], [], skipTypedArray) as string[];\n return
ENGINE.makeTensor(values, inferredShape, inferredDtype) as T;\n}\n\nexport function convertToTensorArray<T
extends Tensor>(\n arg: Array<T|TensorLike>, argName: string, functionName: string,\n parseAsDtype:
DataType|'numeric'|'string_or_numeric' = 'numeric'): T[] {\n if (!Array.isArray(arg)) {\n throw new Error(\n
`Argument ${argName} passed to ${functionName} must be a ` +\n `Tensor[] or TensorLike[]`);\n }\n
const tensors = arg as T[];\n return tensors.map(\n (t, i) =>\n convertToTensor(t, `${argName}[${i}]`,
functionName, parseAsDtype));\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====
*\nimport {ENGINE} from './engine';\nimport {isPromise} from './util';\n\nexport const OP_SCOPE_SUFFIX =
'__op';\n\n/**\n * Used for wrapping functions that perform math operations on\n * Tensors. The function will be

```

```

wrapped in a named scope that cleans all memory usage after the function is done.
export function op<T extends Function>(f: {[name: string]: T}): T {
 const keys = Object.keys(f);
 if (keys.length !== 1) {
 throw new Error(`Please provide an object with a single key` + (operation name) mapping to a function. Got an object with` + keys.length keys.`);
 }
 let opName = keys[0];
 const fn = f[opName];
 // Strip the underscore from the end of the function name.
 if (opName.endsWith('_')) {
 opName = opName.substring(0, opName.length - 1);
 }
 // add an __op suffix to distinguish ops from kernels in tf.profile
 opName = opName + OP_SCOPE_SUFFIX;
 // tslint:disable-next-line:no-any
 const f2 = (...args: any[]) => {
 ENGINE.startScope(opName);
 try {
 const result = fn(...args);
 if (isPromise(result)) {
 console.error('Cannot return a Promise inside of tidy.');
```

```

 }
 ENGINE.endScope(result);
 return result;
 } catch (ex) {
 ENGINE.endScope(null);
 throw ex;
 }
};
Object.defineProperty(f2, 'name', { value: opName, configurable: true });
// tslint:disable-next-line:no-any
return f2 as any as T;
}
/**
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS"
 * BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
import {ENGINE} from '../engine';
import {Complex, ComplexInputs} from '../kernel_names';
import {Tensor} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from '../types';
import * as util from '../util';
import {op} from '../operation';
/**
 * Converts two real numbers to a complex number.
 * Given a tensor `real` representing the real part of a complex number, and a tensor `imag` representing the imaginary part of a complex number, this operation returns complex numbers elementwise of the form [r0, i0, r1, i1], where r represents the real part and i represents the imag part.
 * The input tensors real and imag must have the same shape.
 * const real = tf.tensor1d([2.25, 3.25]);
 * const imag = tf.tensor1d([4.75, 5.75]);
 * const complex = tf.complex(real, imag);
 * complex.print();
 * @doc {heading: 'Tensors', subheading: 'Creation'}
 */
function complex<T extends Tensor>(real: T|TensorLike, imag: T|TensorLike): T {
 const $real = convertToTensor(real, 'real', 'complex');
 const $imag = convertToTensor(imag, 'imag', 'complex');
 util.assertShapesMatch($real.shape, $imag.shape, `real and imag shapes, ${$real.shape} and ${$imag.shape},` + `must match in call to tf.complex().`);
 const inputs: ComplexInputs = {real: $real, imag: $imag};
 return ENGINE.runKernel(Complex, inputs as { } as NamedTensorMap);
}
export const complex = op({complex_});
/**
 * @license
 * Copyright 2018 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
=====
import {ENGINE} from '../engine';
import {Tensor} from '../tensor';
import {TensorLike, TypedArray} from '../types';
import {DataType} from '../types';
import {assert, assertNonNegativeIntegerDimensions, flatten, inferDtype, isTypedArray, sizeFromShape, toTypedArray} from '../util';
/** This is shared code across all tensor creation methods. */
export function makeTensor(values: TensorLike, shape: number[], inferredShape: number[], dtype?: DataType): Tensor {
 if (dtype == null) {
 dtype = inferDtype(values);
 }
 if (dtype === 'complex64') {
 throw new Error(`Cannot construct a complex64 tensor directly.` + `Please use tf.complex(real, imag).`);
 }
 if (!isTypedArray(values) && !Array.isArray(values) && typeof values !== 'number' && typeof values !== 'boolean' && typeof values !== 'string') {
 throw new Error(`values`

```

```

passed to tensor(values) must be a number/boolean/string or '+\n 'an array of numbers/booleans/strings, or a
TypedArray');\n }\n if (shape != null) {\n assertNonNegativeIntegerDimensions(shape);\n const providedSize
= sizeFromShape(shape);\n const inferredSize = sizeFromShape(inferredShape);\n assert(\n providedSize
=== inferredSize,\n () =>\n `Based on the provided shape, [${shape}], the tensor should have `+\n
`${providedSize} values but has ${inferredSize}`);\n for (let i = 0; i < inferredShape.length; ++i) {\n const
inferred = inferredShape[i];\n const flatDimsDontMatch = i === inferredShape.length - 1 ?\n inferred !==
sizeFromShape(shape.slice(i)) :\n true;\n assert(\n inferredShape[i] === shape[i] ||
!flatDimsDontMatch,\n () => `Error creating a new Tensor. Inferred shape `+\n
`${inferredShape}`\n does not match the provided `+\n
`${shape} shape. `);\n }\n }\n if (!isArray(values) &&
!Array.isArray(values)) {\n values = [values] as number[];\n }\n shape = shape || inferredShape;\n values =
dtype !== 'string' ?\n toTypedArray(values, dtype) :\n flatten(values as string[], [], true) as string[];\n return
ENGINE.makeTensor(values as TypedArray, shape, dtype);\n}\n"/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {Tensor} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike} from
 './types';\nimport {DataType, Rank, ShapeMap} from './types';\nimport {makeTensor} from
 './tensor_ops_util';\n\n/**\n * Creates a `tf.Tensor` with the provided values, shape and dtype.\n *\n * ``js\n * //
Pass an array of values to create a vector.\n * tf.tensor([1, 2, 3, 4]).print();\n *\n * ``\n *\n * ``js\n * // Pass a nested
array of values to make a matrix or a higher\n * // dimensional tensor.\n * tf.tensor([[1, 2], [3, 4]]).print();\n *\n *
``\n *\n * ``js\n * // Pass a flat array and specify a shape yourself.\n * tf.tensor([1, 2, 3, 4], [2, 2]).print();\n *\n *
``\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`. If
the values are strings,\n * they will be encoded as utf-8 and kept as `Uint8Array[]`.\n * @param shape The shape
of the tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n *
@doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor<R> extends Rank>(\n values:
TensorLike, shape?: ShapeMap[R], dtype?: DataType): Tensor<R> {\n const inferredShape = inferShape(values,
dtype);\n return makeTensor(values, shape, inferredShape, dtype) as Tensor<R>;\n}\n"/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\n/**\n * Type definitions for exporting and importing of models.\n *\n * A map from Tensor dtype to number
of bytes per element of the Tensor.\n */\nexport const DTYPE_VALUE_SIZE_MAP: {[dtype: string]: number} =
{\n 'float32': 4,\n 'float16': 2,\n 'int32': 4,\n 'uint16': 2,\n 'uint8': 1,\n 'bool': 1,\n 'complex64': 8\n};\n\n/**\n * A
weight manifest.\n *\n * The weight manifest consists of an ordered list of weight-manifest groups.\n * Each weight-
manifest group ("group" for short hereafter) consists of a\n * number of weight values stored in a number of
paths.\n * See the documentation of `WeightManifestGroupConfig` below for more details.\n */\nexport declare
type WeightsManifestConfig = WeightsManifestGroupConfig[];\n\n/**\n * A weight-manifest group.\n *\n * Consists of an ordered list of weight values encoded in binary format,\n * stored in an ordered list of paths.\n */\nexport declare interface WeightsManifestGroupConfig {\n /**\n * An ordered list of paths.\n *\n * Paths are
intentionally abstract in order to be general. For example, they\n * can be relative URL paths or relative paths on

```

the file system.  
`paths: string[];`  
 \* Specifications of the weights stored in the paths.  
`weights: WeightsManifestEntry[];`  
 \* Group to which the weight belongs.  
`'optimizer': Weight`  
 from a stateful optimizer.  
`export type WeightGroup = 'model'|'optimizer';`  
 \* An entry in the weight manifest.  
 \* The entry contains specification of a weight.  
`declare interface WeightsManifestEntry`  
`{`  
 \* Name of the weight, e.g., 'Dense\_1/bias'  
`name: string;`  
 \* Shape of the weight.  
`shape: number[];`  
 \* Data type of the weight.  
`dtype:`  
`'float32'|'int32'|'bool'|'string'|'complex64';`  
 \* Type of the weight.  
`optional: boolean;`  
 \* The value 'optimizer' indicates the weight belongs to an optimizer  
 \* (i.e., used only during model training and not during inference).  
`group?: WeightGroup;`  
 \* Information for dequantization of the weight.  
`quantization?: {`  
`scale?: number, // The scaling constant to multiply by.`  
`min?: number, // The (possibly nudged) minimum weight to add.`  
`dtype: 'uint16'|'uint8'|'float16' // The dtype of the quantized weights.`  
`};`  
 \* Options for saving a model.  
`@namespace io`  
`export interface SaveConfig`  
`{`  
 \* Whether to save only the trainable weights of the model, ignoring the  
 \* non-trainable ones.  
`trainableOnly?: boolean;`  
 \* Whether the optimizer will be saved (if exists).  
`saveOptimizer?: boolean;`  
 \* Default: `false`.  
`includeOptimizer?: boolean;`  
 \* Result of a saving operation.  
`export interface SaveResult`  
`{`  
 \* Information about the model artifacts saved.  
`modelArtifactsInfo: ModelArtifactsInfo;`  
 \* HTTP responses from the server that handled the model-saving request (if any). This is applicable only to server-based saving routes.  
`responses?: Response[];`  
 \* Error messages and related data (if any).  
`errors?: Array<string>;`  
`export declare interface ModelArtifactsInfo`  
`{`  
 \* Timestamp for when the model is saved.  
`dateSaved: Date;`  
 \* TODO (cais,yassogba) consider removing GraphDef as GraphDefs now  
 \* come in a JSON format and none of our IOHandlers support a non json  
 \* format. We could consider replacing this with 'Binary' if we want to  
 \* allow future handlers to save to non json formats (though they will  
 \* probably want more information than 'Binary').  
`topologyType: 'JSON'|'GraphDef';`  
 \* Type of the model topology.  
`topology: string;`  
 \* Possible values:  
 \* - JSON: JSON config (human-readable, e.g., Keras JSON).  
 \* - GraphDef: TensorFlow  
`[GraphDef](https://www.tensorflow.org/extend/tool_developers/#graphdef)`  
 \* protocol buffer (binary).  
`modelTopologyType: 'JSON'|'GraphDef';`  
 \* Size of model topology (Keras JSON or GraphDef), in bytes.  
`modelTopologyBytes?: number;`  
 \* Size of weight specification or manifest, in bytes.  
`weightSpecsBytes?: number;`  
 \* Size of weight value data, in bytes.  
`weightDataBytes?: number;`  
 \* Model training configuration.  
`export declare interface TrainingConfig`  
`{`  
 \* TODO(cais): Tighten the typing once keras spec is available to tfjs-core.  
 \* See  
 \* tslint:disable-next-line:max-line-length  
 \* https://github.com/tensorflow/tfjs-layers/blob/master/src/keras\_format/training\_config.ts  
 \* Optimizer used for the model training.  
`optimizer_config: {};`  
 \* TODO(cais): Tighten the typing once keras spec is available to tfjs-core.  
 \* Loss function(s) for the model's output(s).  
`loss: string|string[]|{[key: string]: string};`  
 \* TODO(cais): Tighten the typing once keras spec is available to tfjs-core.  
 \* Metric function(s) for the model's output(s).  
`metrics?: string[]|{[key: string]: string};`  
 \* TODO(cais): Tighten the typing once keras spec is available to tfjs-core.  
`weighted_metrics?: string[];`  
 \* TODO(cais): Tighten the typing once keras spec is available to tfjs-core.  
`sample_weight_mode?: string;`  
`loss_weights?: number[]|{[key: string]: number};`  
 \* The serialized artifacts of a model, including topology and weights.  
 \* The 'modelTopology', 'trainingConfig', 'weightSpecs' and 'weightData' fields  
 \* of this interface are optional, in order to support topology- or weights-only  
 \* saving and loading.  
 \* Note this interface is used internally in IOHandlers. For the file format  
 \* written to disk as 'model.json', see 'ModelJSON'.  
`export declare interface ModelArtifacts`  
`{`  
 \* Model topology.  
`topology: string;`  
 \* For Keras-style 'tf.Model's, this is a JSON object.  
 \* For TensorFlow-style models (e.g., 'SavedModel'), this is the JSON  
 \* encoding of the 'GraphDef' protocol buffer.  
`modelTopology?: {}|ArrayBuffer;`  
 \* Serialized configuration for the model's training.  
`trainingConfig?: TrainingConfig;`  
 \* Weight specifications.  
`weightSpecs: WeightsManifestEntry[];`  
 \* This corresponds to the weightsData below.  
`weightSpecs?: WeightsManifestEntry[];`  
 \* Binary buffer for all weight values concatenated in the order specified  
 \* by 'weightSpecs'.  
`weightData?: ArrayBuffer;`  
 \*

Hard-coded format name for models saved from TensorFlow.js or converted by TensorFlow.js Converter.

`format?: string;` What library is responsible for originally generating this artifact.

`usedForDebugging?: boolean;` Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.

`generatedBy?: string;` What library or tool is responsible for converting the original model to this format, applicable only if the model is output by a converter.

`usedForDebugging?: boolean;` Used for debugging purposes. E.g., 'TensorFlow.js Converter v1.0.0'.

`valueOfNull?: boolean;` A value of `null` means the model artifacts are generated without any conversion process (e.g., saved directly from a TensorFlow.js `tf.LayersModel`` instance).

`convertedBy?: string|null;` Inputs and outputs signature for saved model.

`signature?: { };` User-defined metadata about the model.

`userDefinedMetadata?: {[key: string]: { }};` Initializer for the model.

`modelInitializer?: { };` The on-disk format of the `model.json` file.

`tfjs1.0AlwaysPopulatesOptionalFields?: boolean;` TF.js 1.0 always populates the optional fields when writing model.json. Prior versions did not provide those fields.

`export declare interface ModelJSON {`

`topology: ModelTopology;` Model topology.

`forKerasStyleTfModel?: tf.Model;` For Keras-style `tf.Model`s`, this is a JSON object.

`forTensorFlowStyleModel?: SavedModel;` For TensorFlow-style models (e.g., `SavedModel``), this is the JSON encoding of the `GraphDef`` protocol buffer.

`modelTopology: { };` Model training configuration.

`trainingConfig?: TrainingConfig;` Weights manifest.

`weightsManifest?: WeightsManifest;` The weights manifest consists of an ordered list of weight-manifest groups. Each weight-manifest group consists of a number of weight values stored in a number of paths. See the documentation of `WeightsManifestConfig`` for more details.

`weightsManifest: WeightsManifestConfig;` Hard-coded format name for models saved from TensorFlow.js or converted by TensorFlow.js Converter.

`format?: string;` What library is responsible for originally generating this artifact.

`usedForDebugging?: boolean;` Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.

`generatedBy?: string;` What library or tool is responsible for converting the original model to this format, applicable only if the model is output by a converter.

`usedForDebugging?: boolean;` Used for debugging purposes. E.g., 'TensorFlow.js Converter v1.0.0'.

`valueOfNull?: boolean;` A value of `null` means the model artifacts are generated without any conversion process (e.g., saved directly from a TensorFlow.js `tf.LayersModel`` instance).

`convertedBy?: string|null;` Inputs and outputs signature for saved model.

`signature?: { };` User-defined metadata about the model.

`userDefinedMetadata?: {[key: string]: { }};` Initializer for the model.

`modelInitializer?: { };` Type definition for handlers of loading operations.

`export type LoadHandler = () => Promise<ModelArtifacts>;` Type definition for handlers of saving operations.

`export type SaveHandler = (modelArtifact: ModelArtifacts) => Promise<SaveResult>;` Interface for a model import/export handler.

`save? and load? handlers are both optional, in order to allow handlers that support only saving or loading.`

`// tslint:disable-next-line:interface-name` export interface IOHandler {

`save?: SaveHandler;`

`load?: LoadHandler;`

`}`

An interface for the manager of a model store.

A model store is defined as a storage medium on which multiple models can be stored. Each stored model has a unique `path`` as its identifier.

A `ModelStoreManager`` for the store allows actions including

- Listing the models stored in the store.
- Deleting a model from the store.

export interface ModelStoreManager {

`listModels(): Promise<{[path: string]: ModelArtifactsInfo}>;` List all models in the model store.

`@returns A dictionary mapping paths of existing models to their model artifacts info.` Model artifacts info include type of the model's topology, byte sizes of the topology, weights, etc.

`listModels(): Promise<{[path: string]: ModelArtifactsInfo}>;` Remove a model specified by `path``.

`@param path` @returns ModelArtifactsInfo of the deleted model (if and only if deletion is successful).

`@throws Error if deletion fails, e.g., if no model exists at `path`.` removeModel(path: string): Promise<ModelArtifactsInfo>;

`callback for the progress of a long-running action such as an HTTP request for a large binary object.` fraction` should be a number in the [0, 1] interval, indicating how much of the action has completed.

export type OnProgressCallback = (fraction: number) => void;

`@namespace io` export interface LoadOptions {

`requestInit?: RequestInit;` RequestInit (options) for HTTP requests.

`@param path` For detailed information on the supported fields, see [https://developer.mozilla.org/en-US/docs/Web/API/Request/Request] (https://developer.mozilla.org/en-US/docs/Web/API/Request/Request)

`requestInit?: RequestInit;` Progress callback.

onProgress?: OnProgressCallback;\n\n /\*\*\n \* A function used to override the `window.fetch` function.\n \*/\n fetchFunc?: Function;\n\n /\*\*\n \* Strict loading model: whether extraneous weights or missing\n \* weights should trigger an `Error`.\n \*/\n \* If `true`, require that the provided weights exactly match those\n \* required by the layers. `false` means that both extra weights\n \* and missing weights will be silently ignored.\n \*/\n \* Default: `true`.\n \*/\n strict?: boolean;\n\n /\*\*\n \* Path prefix for weight files, by default this is calculated from the\n \* path of the model JSON file.\n \*/\n \* For instance, if the path to the model JSON file is\n \* `http://localhost/foo/model.json`, then the default path prefix will be\n \* `http://localhost/foo/`. If a weight file has the path value\n \* `group1-shard1of2` in the weight manifest, then the weight file will be\n \* loaded from `http://localhost/foo/group1-shard1of2` by default. However,\n \* if you provide a `weightPathPrefix` value of\n \* `http://localhost/foo/alt-weights`, then the weight file will be loaded\n \* from the path `http://localhost/foo/alt-weights/group1-shard1of2` instead.\n \*/\n weightPathPrefix?: string;\n\n /\*\*\n \* Whether the module or model is to be loaded from TF Hub.\n \*/\n \* Setting this to `true` allows passing a TF-Hub module URL, omitting the\n \* standard model file name and the query parameters.\n \*/\n \* Default: `false`.\n \*/\n fromTFHub?: boolean;\n\n /\*\*\n \* An async function to convert weight file name to URL. The weight file\n \* names are stored in model.json's weightsManifest.paths field. By default we\n \* consider weight files are colocated with the model.json file. For example:\n \* model.json URL: https://www.google.com/models/1/model.json\n \* group1-shard1of1.bin url: https://www.google.com/models/1/group1-shard1of1.bin\n \* With this func you can convert the weight file name to any URL.\n \*/\n weightUrlConverter?: (weightFileName: string) => Promise<string>;\n\n\n /\*\*\n \* Additional options for Platform.fetch\n \*/\n\nexport interface RequestDetails {\n\n /\*\*\n \* Is this request for a binary file (as opposed to a json file)\n \*/\n isBinary?: boolean;\n\n\n "use strict"\n\n exports.byteLength = byteLength\n\n exports.toByteArray = toByteArray\n\n exports.fromByteArray = fromByteArray\n\n\n var lookup = []\n\n var revLookup = []\n\n\n var Arr = typeof Uint8Array !== 'undefined' ? Uint8Array : Array\n\n\n var code = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'\n\n for (var i = 0, len = code.length; i < len; ++i) {\n lookup[i] = code[i]\n revLookup[code.charCodeAt(i)] = i\n\n\n // Support decoding URL-safe base64 strings, as Node.js does.\n // See: https://en.wikipedia.org/wiki/Base64#URL\_applications\n\n revLookup['-' + code.charCodeAt(0)] = 62\n\n revLookup['\_' + code.charCodeAt(0)] = 63\n\n\n function getLens (b64) {\n var len = b64.length\n\n if (len % 4 > 0) {\n throw new Error('Invalid string. Length must be a multiple of 4')\n }\n\n // Trim off extra bytes after placeholder bytes are found\n // See: https://github.com/beatgammit/base64-js/issues/42\n var validLen = b64.indexOf('=')\n if (validLen === -1) validLen = len\n var placeholdersLen = validLen === len ? 0 : 4 - (validLen % 4)\n\n return [validLen, placeholdersLen]\n\n\n // base64 is 4/3 + up to two characters of the original data\n\n function byteLength (b64) {\n var lens = getLens(b64)\n var validLen = lens[0]\n var placeholdersLen = lens[1]\n return ((validLen + placeholdersLen) \* 3 / 4) - placeholdersLen\n\n\n function \_byteLength (b64, validLen, placeholdersLen) {\n return ((validLen + placeholdersLen) \* 3 / 4) - placeholdersLen\n\n\n function toByteArray (b64) {\n var tmp\n var lens = getLens(b64)\n var validLen = lens[0]\n var placeholdersLen = lens[1]\n var arr = new Arr(\_byteLength(b64, validLen, placeholdersLen))\n var curByte = 0\n\n // if there are placeholders, only get up to the last complete 4 chars\n var len = placeholdersLen > 0 ? validLen - 4 : validLen\n\n var i\n for (i = 0; i < len; i += 4) {\n tmp =\n (revLookup[b64.charCodeAt(i)] << 18) |\n (revLookup[b64.charCodeAt(i + 1)] << 12) |\n (revLookup[b64.charCodeAt(i + 2)] << 6) |\n revLookup[b64.charCodeAt(i + 3)]\n\n arr[curByte++] = (tmp >> 16) & 0xFF\n arr[curByte++] = (tmp >> 8) & 0xFF\n arr[curByte++] = tmp & 0xFF\n }\n\n if (placeholdersLen === 2) {\n tmp =\n (revLookup[b64.charCodeAt(i)] << 2) |\n (revLookup[b64.charCodeAt(i + 1)] >> 4)\n arr[curByte++] = tmp & 0xFF\n }\n\n if (placeholdersLen === 1) {\n tmp =\n (revLookup[b64.charCodeAt(i)] << 10) |\n (revLookup[b64.charCodeAt(i + 1)] << 4) |\n (revLookup[b64.charCodeAt(i + 2)] >> 2)\n arr[curByte++] = (tmp >> 8) & 0xFF\n arr[curByte++] = tmp & 0xFF\n }\n\n return arr\n\n\n function tripletToBase64 (num) {\n return lookup[num >> 18 & 0x3F] +\n lookup[num >> 12 & 0x3F] +\n lookup[num >> 6 & 0x3F] +\n lookup[num & 0x3F]\n\n\n function encodeChunk (uint8, start, end) {\n var tmp\n var output = []\n for (var i = start; i < end; i += 3) {\n tmp =\n ((uint8[i] << 16) & 0xFF0000) +\n ((uint8[i + 1] << 8) & 0xFF00) +\n (uint8[i + 2] & 0xFF)\n





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Buffer.TYPED_ARRAY_SUPPORT ? 0x7fffffff : 0x3fffffff\n\nfunction createBuffer (that, length) {\n
if (kMaxLength() < length) {\n throw new RangeError('Invalid typed array length')\n }\n if\n
(Buffer.TYPED_ARRAY_SUPPORT) {\n // Return an augmented `Uint8Array` instance, for best performance\n
that = new Uint8Array(length)\n that.__proto__ = Buffer.prototype\n } else {\n // Fallback: Return an object\n
instance of the Buffer class\n if (that === null) {\n that = new Buffer(length)\n }\n that.length = length\n
}\n\n return that\n}\n\n/**\n * The Buffer constructor returns instances of `Uint8Array` that have their\n *
prototype changed to `Buffer.prototype`. Furthermore, `Buffer` is a subclass of\n * `Uint8Array`, so the returned\n
instances will have all the node `Buffer` methods\n * and the `Uint8Array` methods. Square bracket notation works\n
as expected -- it\n * returns a single octet.\n *\n * The `Uint8Array` prototype remains unmodified.\n */\n\nfunction\n
Buffer (arg, encodingOrOffset, length) {\n if (!Buffer.TYPED_ARRAY_SUPPORT && !(this instanceof Buffer))\n
{\n return new Buffer(arg, encodingOrOffset, length)\n }\n\n // Common case.\n if (typeof arg === 'number') {\n
 if (typeof encodingOrOffset === 'string') {\n throw new Error(\n 'If encoding is specified then the first\n
argument must be a string'\n)\n }\n return allocUnsafe(this, arg)\n }\n return from(this, arg,\n
encodingOrOffset, length)\n}\n\nBuffer.poolSize = 8192 // not used by this implementation\n\n// TODO: Legacy,\n
not needed anymore. Remove in next major version.\n\nBuffer._augment = function (arr) {\n arr.__proto__ =\n
Buffer.prototype\n return arr\n}\n\nfunction from (that, value, encodingOrOffset, length) {\n if (typeof value ===\n
'number') {\n throw new TypeError('"value" argument must not be a number')\n }\n if (typeof ArrayBuffer\n
!== 'undefined' && value instanceof ArrayBuffer) {\n return fromArrayBuffer(that, value, encodingOrOffset,\n
length)\n }\n if (typeof value === 'string') {\n return fromString(that, value, encodingOrOffset)\n }\n\n return\n
fromObject(that, value)\n}\n\n/**\n * Functionally equivalent to Buffer(arg, encoding) but throws a TypeError\n * if\n
value is a number.\n * Buffer.from(str[, encoding])\n * Buffer.from(array)\n * Buffer.from(buffer)\n *\n
Buffer.from(arrayBuffer[, byteOffset[, length]])\n */\n\nBuffer.from = function (value, encodingOrOffset, length) {\n
return from(null, value, encodingOrOffset, length)\n}\n\nif (Buffer.TYPED_ARRAY_SUPPORT) {\n
Buffer.prototype.__proto__ = Uint8Array.prototype\n Buffer.__proto__ = Uint8Array\n if (typeof Symbol !==\n
'undefined' && Symbol.species &&\n Buffer[Symbol.species] === Buffer) {\n // Fix subarray() in ES2016.\n
See: https://github.com/feross/buffer/pull/97\n Object.defineProperty(Buffer, Symbol.species, {\n value: null,\n
configurable: true\n })\n }\n}\n\nfunction assertSize (size) {\n if (typeof size !== 'number') {\n throw new\n
TypeError('"size" argument must be a number')\n } else if (size < 0) {\n throw new RangeError('"size"\n
argument must not be negative')\n }\n}\n\nfunction alloc (that, size, fill, encoding) {\n assertSize(size)\n if (size\n
<= 0) {\n return createBuffer(that, size)\n }\n if (fill !== undefined) {\n // Only pay attention to encoding if it's\n
a string. This\n // prevents accidentally sending in a number that would\n // be interpreted as a start offset.\n
return typeof encoding === 'string'\n ? createBuffer(that, size).fill(fill, encoding)\n : createBuffer(that,\n
size).fill(fill)\n }\n return createBuffer(that, size)\n}\n\n/**\n * Creates a new filled Buffer instance.\n * alloc(size[, fill[, encoding]])\n */\n\nBuffer.alloc = function (size, fill, encoding) {\n return alloc(null, size, fill,\n
encoding)\n}\n\nfunction allocUnsafe (that, size) {\n assertSize(size)\n that = createBuffer(that, size < 0 ? 0 :\n
checked(size) | 0)\n if (!Buffer.TYPED_ARRAY_SUPPORT) {\n for (var i = 0; i < size; ++i) {\n that[i] = 0\n
}\n }\n return that\n}\n\n/**\n * Equivalent to Buffer(num), by default creates a non-zero-filled Buffer instance.\n *\n
*/\n\nBuffer.allocUnsafe = function (size) {\n return allocUnsafe(null, size)\n}\n\n/**\n * Equivalent to\n
SlowBuffer(num), by default creates a non-zero-filled Buffer instance.\n */\n\nBuffer.allocUnsafeSlow = function\n
(size) {\n return allocUnsafe(null, size)\n}\n\nfunction fromString (that, string, encoding) {\n if (typeof encoding\n
!== 'string' || encoding === '') {\n encoding = 'utf8'\n }\n if (!Buffer.isEncoding(encoding)) {\n throw new\n
TypeError('"encoding" must be a valid string encoding')\n }\n var length = byteLength(string, encoding) | 0\n
that = createBuffer(that, length)\n\n var actual = that.write(string, encoding)\n\n if (actual !== length) {\n //\n
Writing a hex string, for example, that contains invalid characters will\n // cause everything after the first invalid\n
character to be ignored. (e.g.\n // 'abxcd' will be treated as 'ab')\n that = that.slice(0, actual)\n }\n\n return\n
that\n}\n\nfunction fromArrayLike (that, array) {\n var length = array.length < 0 ? 0 : checked(array.length) | 0\n
that = createBuffer(that, length)\n for (var i = 0; i < length; i += 1) {\n that[i] = array[i] & 255\n }\n return\n
that\n}\n\nfunction fromArrayBuffer (that, array, byteOffset, length) {\n array.byteLength // this throws if `array` is

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not a valid ArrayBuffer\n\n if (byteOffset < 0 || array.byteLength < byteOffset) {\n throw new
RangeError("\'offset\' is out of bounds')\n }\n\n if (array.byteLength < byteOffset + (length || 0)) {\n throw new
RangeError("\'length\' is out of bounds')\n }\n\n if (byteOffset === undefined && length === undefined) {\n
array = new Uint8Array(array)\n } else if (length === undefined) {\n array = new Uint8Array(array, byteOffset)\n
} else {\n array = new Uint8Array(array, byteOffset, length)\n }\n\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n
// Return an augmented `Uint8Array` instance, for best performance\n that = array\n that.__proto__ =
Buffer.prototype\n } else {\n // Fallback: Return an object instance of the Buffer class\n that =
fromArrayLike(that, array)\n }\n\n return that\n}\n\nfunction fromObject (that, obj) {\n if (Buffer.isBuffer(obj)) {\n
var len = checked(obj.length) | 0\n that = createBuffer(that, len)\n\n if (that.length === 0) {\n return that\n
}\n\n obj.copy(that, 0, 0, len)\n return that\n }\n\n if (obj) {\n if ((typeof ArrayBuffer !== 'undefined' &&\n
obj.buffer instanceof ArrayBuffer) || 'length' in obj) {\n if (typeof obj.length !== 'number' || !isn(obj.length))\n {\n return createBuffer(that, 0)\n }\n return fromArrayLike(that, obj)\n }\n\n if (obj.type === 'Buffer'\n
&& isArray(obj.data)) {\n return fromArrayLike(that, obj.data)\n }\n}\n\n throw new TypeError('First
argument must be a string, Buffer, ArrayBuffer, Array, or array-like object.')

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// Force coercion to uint32. This will also coerce falsey/NaN values to 0.
end >>>= 0
start >>>= 0
if (end <= start) {
 return ""
}
if (!encoding) encoding = 'utf8'
while (true) {
 switch (encoding) {
 case 'hex':
 return hexSlice(this, start, end)
 case 'utf8':
 case 'utf-8':
 return utf8Slice(this, start, end)
 case 'ascii':
 return asciiSlice(this, start, end)
 case 'latin1':
 case 'binary':
 return latin1Slice(this, start, end)
 case 'base64':
 return base64Slice(this, start, end)
 case 'ucs2':
 case 'ucs-2':
 case 'utf16le':
 case 'utf-16le':
 return utf16leSlice(this, start, end)
 default:
 if (loweredCase) throw new TypeError('Unknown encoding: ' + encoding)
 encoding = (encoding + '').toLowerCase()
 loweredCase = true
 }
}
// The property is used by `Buffer.isBuffer` and `is-buffer` (in Safari 5-7) to detect Buffer instances.
Buffer.prototype._isBuffer = true
function swap(b, n, m) {
 var i = b[n]
 b[n] = b[m]
 b[m] = i
}
Buffer.prototype.swap16 = function swap16() {
 var len = this.length
 if (len % 2 !== 0) throw new RangeError('Buffer size must be a multiple of 16-bits')
 for (var i = 0; i < len; i += 2) swap(this, i, i + 1)
 return this
}
Buffer.prototype.swap32 = function swap32() {
 var len = this.length
 if (len % 4 !== 0) throw new RangeError('Buffer size must be a multiple of 32-bits')
 for (var i = 0; i < len; i += 4) swap(this, i, i + 3) swap(this, i + 1, i + 2)
 return this
}
Buffer.prototype.swap64 = function swap64() {
 var len = this.length
 if (len % 8 !== 0) throw new RangeError('Buffer size must be a multiple of 64-bits')
 for (var i = 0; i < len; i += 8) swap(this, i, i + 7) swap(this, i + 1, i + 6) swap(this, i + 2, i + 5) swap(this, i + 3, i + 4)
 return this
}
Buffer.prototype.toString = function toString() {
 var length = this.length | 0
 if (length === 0) return ""
 if (arguments.length === 0) return utf8Slice(this, 0, length)
 return slowToString.apply(this, arguments)
}
Buffer.prototype.equals = function equals(b) {
 if (!Buffer.isBuffer(b)) throw new TypeError('Argument must be a Buffer')
 if (this === b) return true
 return Buffer.compare(this, b) === 0
}
Buffer.prototype.inspect = function inspect() {
 var str = ""
 var max = exports.INSPECT_MAX_BYTES
 if (this.length > 0) str = this.toString('hex', 0, max).match(/.{2}/g).join(' ')
 if (this.length > max) str += ' ... '
 return '<Buffer ' + str + '>'
}
Buffer.prototype.compare = function compare(target, start, end, thisStart, thisEnd) {
 if (!Buffer.isBuffer(target)) throw new TypeError('Argument must be a Buffer')
 if (start === undefined) start = 0
 if (end === undefined) end = target ? target.length : 0
 if (thisStart === undefined) thisStart = 0
 if (thisEnd === undefined) thisEnd = this.length
 if (start < 0 || end > target.length || thisStart < 0 || thisEnd > this.length) throw new RangeError('out of range index')
 if (thisStart >= thisEnd && start >= end) return 0
 if (thisStart >= thisEnd) return -1
 if (start >= end) return 1
 start >>>= 0
 end >>>= 0
 thisStart >>>= 0
 thisEnd >>>= 0
 if (this === target) return 0
 var x = thisEnd - thisStart
 var y = end - start
 var len = Math.min(x, y)
 var thisCopy = this.slice(thisStart, thisEnd)
 var targetCopy = target.slice(start, end)
 for (var i = 0; i < len; ++i) {
 if (thisCopy[i] !== targetCopy[i]) {
 x = thisCopy[i]
 y = targetCopy[i]
 break
 }
 }
 if (x < y) return -1
 if (y < x) return 1
 return 0
}
// Finds either the first index of `val` in `buffer` at offset >= `byteOffset`, OR the last index of `val` in `buffer` at offset <= `byteOffset`.
// Arguments:
// - buffer - a Buffer to search
// - val - a string, Buffer, or number
// - byteOffset - an index into `buffer`; will be clamped to an int32
// - encoding - an optional encoding, relevant is val is a string
// - dir - true for indexOf, false for lastIndexOf
function bidirectionalIndexOf(buffer, val, byteOffset, encoding, dir) {
 // Empty buffer means no match
 if (buffer.length === 0) return -1
 // Normalize byteOffset
 if (typeof byteOffset !== 'string') {
 encoding = byteOffset
 byteOffset = 0
 } else if (byteOffset > 0x7fffffff) {
 byteOffset = 0x7fffffff
 } else if (byteOffset < -0x80000000) {
 byteOffset = -0x80000000
 }
 byteOffset = +byteOffset // Coerce to Number.
 if (isNaN(byteOffset)) {
 // byteOffset: it's undefined, null, NaN, "foo", etc, search whole buffer
 byteOffset = dir ? 0 : (buffer.length - 1)
 }
 // Normalize byteOffset: negative offsets start from the end of the buffer
 if (byteOffset < 0) byteOffset = buffer.length + byteOffset
 if (byteOffset >= buffer.length) {
 if (dir) return -1
 else byteOffset = buffer.length - 1
 } else if (byteOffset < 0) {
 if (dir) byteOffset = 0
 else return -1
 }
 // Normalize val
 if (typeof val === 'string') {
 val = Buffer.from(val, encoding)
 }
 // Finally, search either indexOf (if dir is true) or lastIndexOf
 if (Buffer.isBuffer(val)) {
 // Special case: looking for empty

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string/buffer always fails\n if (val.length === 0) {\n return -1\n }\n return arrayIndexOf(buffer, val,\n byteOffset, encoding, dir)\n } else if (typeof val === 'number') {\n val = val & 0xFF // Search for a byte value [0-255]\n if (Buffer.TYPED_ARRAY_SUPPORT &&\n typeof Uint8Array.prototype.indexOf === 'function')\n {\n if (dir) {\n return Uint8Array.prototype.indexOf.call(buffer, val, byteOffset)\n } else {\n return\n Uint8Array.prototype.lastIndexOf.call(buffer, val, byteOffset)\n }\n }\n return arrayIndexOf(buffer, [val],\n byteOffset, encoding, dir)\n }\n\n throw new TypeError('val must be string, number or Buffer')\n}\n\nfunction\narrayIndexOf (arr, val, byteOffset, encoding, dir) {\n var indexSize = 1\n var arrLength = arr.length\n var\n valLength = val.length\n\n if (encoding !== undefined) {\n encoding = String(encoding).toLowerCase()\n if\n (encoding === 'ucs2' || encoding === 'ucs-2' ||\n encoding === 'utf16le' || encoding === 'utf-16le') {\n if\n (arr.length < 2 || val.length < 2) {\n return -1\n }\n indexSize = 2\n arrLength /= 2\n valLength /=\n 2\n byteOffset /= 2\n }\n }\n\n function read (buf, i) {\n if (indexSize === 1) {\n return buf[i]\n } else\n {\n return buf.readUInt16BE(i * indexSize)\n }\n }\n\n var i\n if (dir) {\n var foundIndex = -1\n for (i =\n byteOffset; i < arrLength; i++) {\n if (read(arr, i) === read(val, foundIndex === -1 ? 0 : i - foundIndex)) {\n if (foundIndex === -1) foundIndex = i\n if (i - foundIndex + 1 === valLength) return foundIndex * indexSize\n }\n } else {\n if (foundIndex !== -1) i -= i - foundIndex\n foundIndex = -1\n }\n } else {\n if\n (byteOffset + valLength > arrLength) byteOffset = arrLength - valLength\n for (i = byteOffset; i >= 0; i--) {\n var found = true\n for (var j = 0; j < valLength; j++) {\n if (read(arr, i + j) !== read(val, j)) {\n found =\n false\n break\n }\n }\n if (found) return i\n }\n }\n\n return -1\n}\n\nBuffer.prototype.includes =\nfunction includes (val, byteOffset, encoding) {\n return this.indexOf(val, byteOffset, encoding) !== -\n 1\n}\n\nBuffer.prototype.indexOf = function indexOf (val, byteOffset, encoding) {\n return\n bidirectionalIndexOf(this, val, byteOffset, encoding, true)\n}\n\nBuffer.prototype.lastIndexOf = function\nlastIndexOf (val, byteOffset, encoding) {\n return bidirectionalIndexOf(this, val, byteOffset, encoding,\n false)\n}\n\nfunction hexWrite (buf, string, offset, length) {\n offset = Number(offset) || 0\n var remaining =\n buf.length - offset\n if (!length) {\n length = remaining\n } else {\n length = Number(length)\n if (length >\n remaining) {\n length = remaining\n }\n }\n\n // must be an even number of digits\n var strLen =\n string.length\n if (strLen % 2 !== 0) throw new TypeError('Invalid hex string')\n if (length > strLen / 2) {\n length = strLen / 2\n }\n for (var i = 0; i < length; ++i) {\n var parsed = parseInt(string.substr(i * 2, 2), 16)\n if\n (isNaN(parsed)) return i\n buf[offset + i] = parsed\n }\n return i\n}\n\nfunction utf8Write (buf, string, offset,\n length) {\n return blitBuffer(utf8ToBytes(string, buf.length - offset), buf, offset, length)\n}\n\nfunction asciiWrite\n(buf, string, offset, length) {\n return blitBuffer(asciiToBytes(string), buf, offset, length)\n}\n\nfunction latin1Write\n(buf, string, offset, length) {\n return asciiWrite(buf, string, offset, length)\n}\n\nfunction base64Write (buf, string,\n offset, length) {\n return blitBuffer(base64ToBytes(string), buf, offset, length)\n}\n\nfunction ucs2Write (buf,\n string, offset, length) {\n return blitBuffer(utf16leToBytes(string, buf.length - offset), buf, offset,\n length)\n}\n\nBuffer.prototype.write = function write (string, offset, length, encoding) {\n // Buffer#write(string)\n if (offset === undefined) {\n encoding = 'utf8'\n length = this.length\n offset = 0\n } // Buffer#write(string,\n encoding)\n } else if (length === undefined && typeof offset === 'string') {\n encoding = offset\n length =\n this.length\n offset = 0\n } // Buffer#write(string, offset[, length][, encoding])\n } else if (isFinite(offset)) {\n offset = offset | 0\n if (isFinite(length)) {\n length = length | 0\n if (encoding === undefined) encoding =\n 'utf8'\n } else {\n encoding = length\n length = undefined\n }\n } // legacy write(string, encoding, offset,\n length) - remove in v0.13\n } else {\n throw new Error('\n 'Buffer.write(string, encoding, offset[, length]) is no\n longer supported'\n)\n }\n\n var remaining = this.length - offset\n if (length === undefined || length >\n remaining) length = remaining\n if ((string.length > 0 && (length < 0 || offset < 0)) || offset > this.length) {\n throw new RangeError('Attempt to write outside buffer bounds')\n }\n\n if (!encoding) encoding = 'utf8'\n\n var\n loweredCase = false\n for (;;) {\n switch (encoding) {\n case 'hex':\n return hexWrite(this, string, offset,\n length)\n\n case 'utf8':\n case 'utf-8':\n return utf8Write(this, string, offset, length)\n\n case 'ascii':\n return asciiWrite(this, string, offset, length)\n\n case 'latin1':\n case 'binary':\n return latin1Write(this,\n string, offset, length)\n\n case 'base64':\n // Warning: maxLength not taken into account in base64Write\n return base64Write(this, string, offset, length)\n\n case 'ucs2':\n case 'ucs-2':\n case 'utf16le':\n case 'utf-

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16le':\n return ucs2Write(this, string, offset, length)\n\n default:\n if (loweredCase) throw new
TypeError('Unknown encoding: ' + encoding)\n encoding = (' + encoding).toLowerCase()\n loweredCase =
true\n }\n}\n\nBuffer.prototype.toJSON = function toJSON () {\n return {\n type: 'Buffer',\n data:
Array.prototype.slice.call(this._arr || this, 0)\n }\n}\n\nfunction base64Slice (buf, start, end) {\n if (start === 0 &&
end === buf.length) {\n return base64.fromByteArray(buf)\n } else {\n return
base64.fromByteArray(buf.slice(start, end))\n }\n}\n\nfunction utf8Slice (buf, start, end) {\n end =
Math.min(buf.length, end)\n var res = []\n var i = start\n while (i < end) {\n var firstByte = buf[i]\n var
codePoint = null\n var bytesPerSequence = (firstByte > 0xEF) ? 4\n : (firstByte > 0xDF) ? 3\n : (firstByte >
0xBF) ? 2\n : 1\n if (i + bytesPerSequence <= end) {\n var secondByte, thirdByte, fourthByte,
tempCodePoint\n switch (bytesPerSequence) {\n case 1:\n if (firstByte < 0x80) {\n codePoint
= firstByte\n }\n break\n case 2:\n secondByte = buf[i + 1]\n if ((secondByte & 0xC0)
=== 0x80) {\n tempCodePoint = (firstByte & 0x1F) << 0x6 | (secondByte & 0x3F)\n if
(tempCodePoint > 0x7F) {\n codePoint = tempCodePoint\n }\n }\n break\n case 3:\n secondByte = buf[i + 1]\n thirdByte = buf[i + 2]\n if ((secondByte & 0xC0) === 0x80 && (thirdByte
& 0xC0) === 0x80) {\n tempCodePoint = (firstByte & 0xF) << 0xC | (secondByte & 0x3F) << 0x6 |
(thirdByte & 0x3F)\n if (tempCodePoint > 0x7FF && (tempCodePoint < 0xD800 || tempCodePoint >
0xDFFF)) {\n codePoint = tempCodePoint\n }\n }\n break\n case 4:\n secondByte = buf[i + 1]\n thirdByte = buf[i + 2]\n fourthByte = buf[i + 3]\n if ((secondByte &
0xC0) === 0x80 && (thirdByte & 0xC0) === 0x80 && (fourthByte & 0xC0) === 0x80) {\n tempCodePoint
= (firstByte & 0xF) << 0x12 | (secondByte & 0x3F) << 0xC | (thirdByte & 0x3F) << 0x6 | (fourthByte & 0x3F)\n if
(tempCodePoint > 0xFFFF && tempCodePoint < 0x110000) {\n codePoint = tempCodePoint\n }\n }\n }\n }\n if (codePoint === null) {\n // we did not generate a valid codePoint so insert a\n
// replacement char (U+FFFD) and advance only 1 byte\n codePoint = 0xFFFF\n bytesPerSequence = 1\n }
 else if (codePoint > 0xFFFF) {\n // encode to utf16 (surrogate pair dance)\n codePoint -= 0x10000\n
 res.push(codePoint >>> 10 & 0x3FF | 0xD800)\n codePoint = 0xDC00 | codePoint & 0x3FF\n }\n res.push(codePoint)\n i += bytesPerSequence\n }\n }\n return decodeCodePointsArray(res)\n}\n\n// Based on
http://stackoverflow.com/a/22747272/680742, the browser with\n// the lowest limit is Chrome, with 0x10000
args.\n// We go 1 magnitude less, for safety\nvar MAX_ARGUMENTS_LENGTH = 0x1000\n\nfunction
decodeCodePointsArray (codePoints) {\n var len = codePoints.length\n if (len <=
MAX_ARGUMENTS_LENGTH) {\n return String.fromCharCode.apply(String, codePoints) // avoid extra
slice()\n }\n // Decode in chunks to avoid "call stack size exceeded"\n var res = ""\n var i = 0\n while (i < len)
{\n res += String.fromCharCode.apply(\n String,\n codePoints.slice(i, i +=
MAX_ARGUMENTS_LENGTH)\n)\n }\n return res\n}\n\nfunction asciiSlice (buf, start, end) {\n var ret = ""\n end =
Math.min(buf.length, end)\n for (var i = start; i < end; ++i) {\n ret += String.fromCharCode(buf[i] &
0x7F)\n }\n return ret\n}\n\nfunction latin1Slice (buf, start, end) {\n var ret = ""\n end = Math.min(buf.length,
end)\n for (var i = start; i < end; ++i) {\n ret += String.fromCharCode(buf[i])\n }\n return ret\n}\n\nfunction
hexSlice (buf, start, end) {\n var len = buf.length\n if (!start || start < 0) start = 0\n if (!end || end < 0 || end > len)
end = len\n var out = ""\n for (var i = start; i < end; ++i) {\n out += toHex(buf[i])\n }\n return
out\n}\n\nfunction utf16leSlice (buf, start, end) {\n var bytes = buf.slice(start, end)\n var res = ""\n for (var i = 0; i <
bytes.length; i += 2) {\n res += String.fromCharCode(bytes[i] + bytes[i + 1] * 256)\n }\n return
res\n}\n\nBuffer.prototype.slice = function slice (start, end) {\n var len = this.length\n start = ~~start\n end = end
=== undefined ? len : ~~end\n if (start < 0) {\n start += len\n if (start < 0) start = 0\n } else if (start > len) {\n
start = len\n }\n if (end < 0) {\n end += len\n if (end < 0) end = 0\n } else if (end > len) {\n end = len\n
 }\n if (end < start) end = start\n var newBuf\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n newBuf =
this.subarray(start, end)\n newBuf.__proto__ = Buffer.prototype\n } else {\n var sliceLen = end - start\n newBuf =
new Buffer(sliceLen, undefined)\n for (var i = 0; i < sliceLen; ++i) {\n newBuf[i] = this[i + start]\n }\n }\n return newBuf\n}\n\n//\n\n* Need to make sure that buffer isn't trying to write out of bounds.\n\n*\n\nfunction checkOffset (offset, ext, length) {\n if ((offset % 1) !== 0 || offset < 0) throw new RangeError('offset is

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not uint')\n if (offset + ext > length) throw new RangeError('Trying to access beyond buffer
length')\n}\n\nBuffer.prototype.readUIntLE = function readUIntLE (offset, byteLength, noAssert) {\n offset =
offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset, byteLength, this.length)\n\n var val =
this[offset]\n var mul = 1\n var i = 0\n while (++i < byteLength && (mul *= 0x100)) {\n val += this[offset + i] *
mul\n }\n\n return val\n}\n\nBuffer.prototype.readUIntBE = function readUIntBE (offset, byteLength, noAssert)
{\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) {\n checkOffset(offset, byteLength,
this.length)\n }\n\n var val = this[offset + --byteLength]\n var mul = 1\n while (byteLength > 0 && (mul *=
0x100)) {\n val += this[offset + --byteLength] * mul\n }\n\n return val\n}\n\nBuffer.prototype.readUInt8 =
function readUInt8 (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 1, this.length)\n return
this[offset]\n}\n\nBuffer.prototype.readUInt16LE = function readUInt16LE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 2, this.length)\n return this[offset] | (this[offset + 1] <<
8)\n}\n\nBuffer.prototype.readUInt16BE = function readUInt16BE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 2, this.length)\n return (this[offset] << 8) | this[offset + 1]\n}\n\nBuffer.prototype.readUInt32LE
= function readUInt32LE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n\n return
((this[offset]) |\n (this[offset + 1] << 8) |\n (this[offset + 2] << 16)) +\n (this[offset + 3] *
0x1000000)\n}\n\nBuffer.prototype.readUInt32BE = function readUInt32BE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 4, this.length)\n\n return (this[offset] * 0x1000000) +\n ((this[offset + 1] << 16) |\n
(this[offset + 2] << 8) |\n this[offset + 3])\n}\n\nBuffer.prototype.readIntLE = function readIntLE (offset,
byteLength, noAssert) {\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset,
byteLength, this.length)\n\n var val = this[offset]\n var mul = 1\n var i = 0\n while (++i < byteLength && (mul *=
0x100)) {\n val += this[offset + i] * mul\n }\n mul *= 0x80\n\n if (val >= mul) val -= Math.pow(2, 8 *
byteLength)\n\n return val\n}\n\nBuffer.prototype.readIntBE = function readIntBE (offset, byteLength, noAssert)
{\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset, byteLength,
this.length)\n\n var i = byteLength\n var mul = 1\n var val = this[offset + --i]\n while (i > 0 && (mul *= 0x100))
{\n val += this[offset + --i] * mul\n }\n mul *= 0x80\n\n if (val >= mul) val -= Math.pow(2, 8 * byteLength)\n\n
return val\n}\n\nBuffer.prototype.readInt8 = function readInt8 (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 1, this.length)\n if (!(this[offset] & 0x80)) return (this[offset])\n return ((0xff - this[offset] + 1)
* -1)\n}\n\nBuffer.prototype.readInt16LE = function readInt16LE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 2, this.length)\n var val = this[offset] | (this[offset + 1] << 8)\n return (val & 0x8000) ? val |
0xFFFF0000 : val\n}\n\nBuffer.prototype.readInt16BE = function readInt16BE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 2, this.length)\n var val = this[offset + 1] | (this[offset] << 8)\n return (val & 0x8000) ? val |
0xFFFF0000 : val\n}\n\nBuffer.prototype.readInt32LE = function readInt32LE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 4, this.length)\n\n return (this[offset]) |\n (this[offset + 1] << 8) |\n (this[offset + 2] << 16)
|\n (this[offset + 3] << 24)\n}\n\nBuffer.prototype.readInt32BE = function readInt32BE (offset, noAssert) {\n if
(!noAssert) checkOffset(offset, 4, this.length)\n\n return (this[offset] << 24) |\n (this[offset + 1] << 16) |\n
(this[offset + 2] << 8) |\n (this[offset + 3])\n}\n\nBuffer.prototype.readFloatLE = function readFloatLE (offset,
noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n return ieee754.read(this, offset, true, 23,
4)\n}\n\nBuffer.prototype.readFloatBE = function readFloatBE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 4, this.length)\n return ieee754.read(this, offset, false, 23,
4)\n}\n\nBuffer.prototype.readDoubleLE = function readDoubleLE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 8, this.length)\n return ieee754.read(this, offset, true, 52,
8)\n}\n\nBuffer.prototype.readDoubleBE = function readDoubleBE (offset, noAssert) {\n if (!noAssert)
checkOffset(offset, 8, this.length)\n return ieee754.read(this, offset, false, 52, 8)\n}\n\nfunction checkInt (buf,
value, offset, ext, max, min) {\n if (!Buffer.isBuffer(buf)) throw new TypeError('"buffer" argument must be a
Buffer instance')\n if (value > max || value < min) throw new RangeError('"value" argument is out of bounds')\n if
(offset + ext > buf.length) throw new RangeError('Index out of range')\n}\n\nBuffer.prototype.writeUIntLE =
function writeUIntLE (value, offset, byteLength, noAssert) {\n value = +value\n offset = offset | 0\n byteLength =
byteLength | 0\n if (!noAssert) {\n var maxBytes = Math.pow(2, 8 * byteLength) - 1\n checkInt(this, value,

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offset, byteLength, maxBytes, 0)\n } \n\n var mul = 1\n var i = 0\n this[offset] = value & 0xFF\n while (++i <
byteLength && (mul *= 0x100)) {\n this[offset + i] = (value / mul) & 0xFF\n } \n\n return offset +
byteLength\n}\n\nBuffer.prototype.writeUIntBE = function writeUIntBE (value, offset, byteLength, noAssert) {\n
value = +value\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) {\n var maxBytes =
Math.pow(2, 8 * byteLength) - 1\n checkInt(this, value, offset, byteLength, maxBytes, 0)\n } \n\n var i =
byteLength - 1\n var mul = 1\n this[offset + i] = value & 0xFF\n while (--i >= 0 && (mul *= 0x100)) {\n
this[offset + i] = (value / mul) & 0xFF\n } \n\n return offset + byteLength\n}\n\nBuffer.prototype.writeUInt8 =
function writeUInt8 (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this,
value, offset, 1, 0xff, 0)\n if (!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n this[offset] =
(value & 0xff)\n return offset + 1\n}\n\nfunction objectWriteUInt16 (buf, value, offset, littleEndian) {\n if (value <
0) value = 0xffff + value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 2); i < j; ++i) {\n buf[offset + i] =
(value & (0xff << (8 * (littleEndian ? i : 1 - i)))) >>>\n (littleEndian ? i : 1 - i) * 8\n
}\n}\n\nBuffer.prototype.writeUInt16LE = function writeUInt16LE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0xffff, 0)\n if
(Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value & 0xff)\n this[offset + 1] = (value >>> 8)\n }
else {\n objectWriteUInt16(this, value, offset, true)\n } \n\n return offset + 2\n}\n\nBuffer.prototype.writeUInt16BE
= function writeUInt16BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert)
checkInt(this, value, offset, 2, 0xffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>>
8)\n this[offset + 1] = (value & 0xff)\n } else {\n objectWriteUInt16(this, value, offset, false)\n } \n\n return
offset + 2\n}\n\nfunction objectWriteUInt32 (buf, value, offset, littleEndian) {\n if (value < 0) value = 0xffffffff +
value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 4); i < j; ++i) {\n buf[offset + i] = (value >>>
(littleEndian ? i : 3 - i) * 8) & 0xff\n } \n}\n\nBuffer.prototype.writeUInt32LE = function writeUInt32LE (value,
offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff,
0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset + 3] = (value >>> 24)\n this[offset + 2] = (value
>>> 16)\n this[offset + 1] = (value >>> 8)\n this[offset] = (value & 0xff)\n } else {\n objectWriteUInt32(this,
value, offset, true)\n } \n\n return offset + 4\n}\n\nBuffer.prototype.writeUInt32BE = function writeUInt32BE (value,
offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff,
0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 24)\n this[offset + 1] = (value >>>
16)\n this[offset + 2] = (value >>> 8)\n this[offset + 3] = (value & 0xff)\n } else {\n objectWriteUInt32(this,
value, offset, false)\n } \n\n return offset + 4\n}\n\nBuffer.prototype.writeIntLE = function writeIntLE (value, offset,
byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n var limit = Math.pow(2, 8 *
byteLength - 1)\n\n checkInt(this, value, offset, byteLength, limit - 1, -limit)\n } \n\n var i = 0\n var mul = 1\n
var sub = 0\n this[offset] = value & 0xFF\n while (++i < byteLength && (mul *= 0x100)) {\n if (value < 0 &&
sub === 0 && this[offset + i - 1] !== 0) {\n sub = 1\n } \n\n this[offset + i] = ((value / mul) >> 0) - sub &
0xFF\n } \n\n return offset + byteLength\n}\n\nBuffer.prototype.writeIntBE = function writeIntBE (value, offset,
byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n var limit = Math.pow(2, 8 *
byteLength - 1)\n\n checkInt(this, value, offset, byteLength, limit - 1, -limit)\n } \n\n var i = byteLength - 1\n var
mul = 1\n var sub = 0\n this[offset + i] = value & 0xFF\n while (--i >= 0 && (mul *= 0x100)) {\n if (value < 0
&& sub === 0 && this[offset + i + 1] !== 0) {\n sub = 1\n } \n\n this[offset + i] = ((value / mul) >> 0) - sub &
0xFF\n } \n\n return offset + byteLength\n}\n\nBuffer.prototype.writeInt8 = function writeInt8 (value, offset,
noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 1, 0x7f, -0x80)\n if
(!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n if (value < 0) value = 0xff + value + 1\n
this[offset] = (value & 0xff)\n return offset + 1\n}\n\nBuffer.prototype.writeInt16LE = function writeInt16LE
(value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2,
0x7fff, -0x8000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value & 0xff)\n this[offset + 1] =
(value >>> 8)\n } else {\n objectWriteUInt16(this, value, offset, true)\n } \n\n return offset +
2\n}\n\nBuffer.prototype.writeInt16BE = function writeInt16BE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0x7fff, -0x8000)\n if

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(Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 8)\n this[offset + 1] = (value & 0xff)\n }
else {\n objectWriteUInt16(this, value, offset, false)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeInt32LE
= function writeInt32LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert)
checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n
this[offset] = (value & 0xff)\n this[offset + 1] = (value >>> 8)\n this[offset + 2] = (value >>> 16)\n this[offset
+ 3] = (value >>> 24)\n } else {\n objectWriteUInt32(this, value, offset, true)\n }\n return offset +
4\n}\n\nBuffer.prototype.writeInt32BE = function writeInt32BE (value, offset, noAssert) {\n value = +value\n
offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (value < 0) value =
0xffffffff + value + 1\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 24)\n this[offset
+ 1] = (value >>> 16)\n this[offset + 2] = (value >>> 8)\n this[offset + 3] = (value & 0xff)\n } else {\n
objectWriteUInt32(this, value, offset, false)\n }\n return offset + 4\n}\n\nfunction checkIEEE754 (buf, value,
offset, ext, max, min) {\n if (offset + ext > buf.length) throw new RangeError('Index out of range')\n if (offset < 0)
throw new RangeError('Index out of range')\n}\n\nfunction writeFloat (buf, value, offset, littleEndian, noAssert) {\n
if (!noAssert) {\n checkIEEE754(buf, value, offset, 4, 3.4028234663852886e+38, -3.4028234663852886e+38)\n
}\n ieee754.write(buf, value, offset, littleEndian, 23, 4)\n return offset + 4\n}\n\nBuffer.prototype.writeFloatLE =
function writeFloatLE (value, offset, noAssert) {\n return writeFloat(this, value, offset, true,
noAssert)\n}\n\nBuffer.prototype.writeFloatBE = function writeFloatBE (value, offset, noAssert) {\n return
writeFloat(this, value, offset, false, noAssert)\n}\n\nfunction writeDouble (buf, value, offset, littleEndian, noAssert)
{\n if (!noAssert) {\n checkIEEE754(buf, value, offset, 8, 1.7976931348623157E+308, -
1.7976931348623157E+308)\n }\n ieee754.write(buf, value, offset, littleEndian, 52, 8)\n return offset +
8\n}\n\nBuffer.prototype.writeDoubleLE = function writeDoubleLE (value, offset, noAssert) {\n return
writeDouble(this, value, offset, true, noAssert)\n}\n\nBuffer.prototype.writeDoubleBE = function writeDoubleBE
(value, offset, noAssert) {\n return writeDouble(this, value, offset, false, noAssert)\n}\n\n// copy(targetBuffer,
targetStart=0, sourceStart=0, sourceEnd=buffer.length)\n\nBuffer.prototype.copy = function copy (target, targetStart,
start, end) {\n if (!start) start = 0\n if (!end && end !== 0) end = this.length\n if (targetStart >= target.length)
targetStart = target.length\n if (!targetStart) targetStart = 0\n if (end > 0 && end < start) end = start\n\n // Copy 0
bytes; we're done\n if (end === start) return 0\n if (target.length === 0 || this.length === 0) return 0\n\n // Fatal
error conditions\n if (targetStart < 0) {\n throw new RangeError('targetStart out of bounds')\n }\n if (start < 0 ||
start >= this.length) throw new RangeError('sourceStart out of bounds')\n if (end < 0) throw new
RangeError('sourceEnd out of bounds')\n\n // Are we oob?\n if (end > this.length) end = this.length\n if
(target.length - targetStart < end - start) {\n end = target.length - targetStart + start\n }\n\n var len = end - start\n
var i\n if (this === target && start < targetStart && targetStart < end) {\n // descending copy from end\n for (i
= len - 1; i >= 0; --i) {\n target[i + targetStart] = this[i + start]\n }\n } else if (len < 1000 ||
!Buffer.TYPED_ARRAY_SUPPORT) {\n // ascending copy from start\n for (i = 0; i < len; ++i) {\n target[i +
targetStart] = this[i + start]\n }\n } else {\n Uint8Array.prototype.set.call(\n target,\n this.subarray(start,
start + len),\n targetStart\n)\n }\n\n return len\n}\n\n// Usage:\n// buffer.fill(number[, offset[, end]])\n//
buffer.fill(buffer[, offset[, end]])\n// buffer.fill(string[, offset[, end]][, encoding])\n\nBuffer.prototype.fill = function
fill (val, start, end, encoding) {\n // Handle string cases:\n if (typeof val === 'string') {\n if (typeof start ===
'string') {\n encoding = start\n start = 0\n end = this.length\n } else if (typeof end === 'string') {\n
encoding = end\n end = this.length\n }\n if (val.length === 1) {\n var code = val.charCodeAt(0)\n if
(code < 256) {\n val = code\n }\n }\n if (encoding !== undefined && typeof encoding !== 'string') {\n
throw new TypeError('encoding must be a string')\n }\n if (typeof encoding === 'string' &&
!Buffer.isEncoding(encoding)) {\n throw new TypeError('Unknown encoding: ' + encoding)\n }\n } else if
(typeof val === 'number') {\n val = val & 255\n }\n\n // Invalid ranges are not set to a default, so can range check
early.\n if (start < 0 || this.length < start || this.length < end) {\n throw new RangeError('Out of range index')\n
}\n\n if (end <= start) {\n return this\n }\n\n start = start >>> 0\n end = end === undefined ? this.length : end
>>> 0\n if (!val) val = 0\n var i\n if (typeof val === 'number') {\n for (i = start; i < end; ++i) {\n this[i] =
val\n }\n } else {\n var bytes = Buffer.isBuffer(val)\n ? val\n : utf8ToBytes(new Buffer(val,

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encoding).toString())\n var len = bytes.length\n for (i = 0; i < end - start; ++i) {\n this[i + start] = bytes[i %
len]\n }\n}\n\nreturn this\n}\n\n// HELPER FUNCTIONS\n// =====\n\nINVALID_BASE64_RE = /^[^+\\0-9A-Za-z-_]/g\n\nfunction base64clean (str) {\n // Node strips out invalid
characters like \\n and \\t from the string, base64-js does not\n str = stringtrim(str).replace(INVALID_BASE64_RE,
")\n // Node converts strings with length < 2 to "\n if (str.length < 2) return "\n // Node allows for non-padded
base64 strings (missing trailing ===), base64-js does not\n while (str.length % 4 !== 0) {\n str = str + '='\n }\n
return str\n}\n\nfunction stringtrim (str) {\n if (str.trim) return str.trim()\n return str.replace(/^[\\s+]|\\s+$/g,
")\n}\n\nfunction toHex (n) {\n if (n < 16) return '0' + n.toString(16)\n return n.toString(16)\n}\n\nfunction
utf8ToBytes (string, units) {\n units = units || Infinity\n var codePoint\n var length = string.length\n var
leadSurrogate = null\n var bytes = []\n\n for (var i = 0; i < length; ++i) {\n codePoint = string.charCodeAt(i)\n\n
// is surrogate component\n if (codePoint > 0xD7FF && codePoint < 0xE000) {\n // last char was a lead\n if
(!leadSurrogate) {\n // no lead yet\n if (codePoint > 0xDBFF) {\n // unexpected trail\n if ((units -
= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n continue\n } else if (i + 1 === length) {\n // unpaired
lead\n if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n continue\n }\n // valid lead\n
leadSurrogate = codePoint\n continue\n }\n // 2 leads in a row\n if (codePoint < 0xDC00) {\n
if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n leadSurrogate = codePoint\n continue\n }\n\n
// valid surrogate pair\n codePoint = (leadSurrogate - 0xD800 << 10 | codePoint - 0xDC00) + 0x10000\n } else
if (leadSurrogate) {\n // valid bmp char, but last char was a lead\n if ((units -= 3) > -1) bytes.push(0xEF,
0xBF, 0xBD)\n }\n\n leadSurrogate = null\n\n // encode utf8\n if (codePoint < 0x80) {\n if ((units -= 1) <
0) break\n bytes.push(codePoint)\n } else if (codePoint < 0x800) {\n if ((units -= 2) < 0) break\n
bytes.push(\n codePoint >> 0x6 | 0xC0,\n codePoint & 0x3F | 0x80\n)\n } else if (codePoint <
0x10000) {\n if ((units -= 3) < 0) break\n bytes.push(\n codePoint >> 0xC | 0xE0,\n codePoint >>
0x6 & 0x3F | 0x80,\n codePoint & 0x3F | 0x80\n)\n } else if (codePoint < 0x110000) {\n if ((units -=
4) < 0) break\n bytes.push(\n codePoint >> 0x12 | 0xF0,\n codePoint >> 0xC & 0x3F | 0x80,\n
codePoint >> 0x6 & 0x3F | 0x80,\n codePoint & 0x3F | 0x80\n)\n } else {\n throw new Error('Invalid
code point')\n }\n}\n}\n\nreturn bytes\n}\n\nfunction asciiToBytes (str) {\n var byteArray = []\n for (var i = 0; i <
str.length; ++i) {\n // Node's code seems to be doing this and not & 0x7F.\n byteArray.push(str.charCodeAt(i) &
0xFF)\n }\n return byteArray\n}\n\nfunction utf16leToBytes (str, units) {\n var c, hi, lo\n var byteArray = []\n for
(var i = 0; i < str.length; ++i) {\n if ((units -= 2) < 0) break\n\n c = str.charCodeAt(i)\n hi = c >> 8\n lo = c %
256\n byteArray.push(lo)\n byteArray.push(hi)\n }\n\n return byteArray\n}\n\nfunction base64ToBytes (str)
{\n return base64.toByteArray(base64clean(str))\n}\n\nfunction blitBuffer (src, dst, offset, length) {\n for (var i =
0; i < length; ++i) {\n if ((i + offset >= dst.length) || (i >= src.length)) break\n dst[i + offset] = src[i]\n }\n
return i\n}\n\nfunction isnan (val) {\n return val !== val // eslint-disable-line no-self-compare\n}\n\n"/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */\n\n
=====
\n
*/\n\nimport {complex} from './ops/complex';\nimport {tensor} from './ops/tensor';\nimport {NamedTensor,
NamedTensorMap} from './tensor_types';\nimport {TypedArray} from './types';\nimport {sizeFromShape} from
 './util';\nimport {DTYPE_VALUE_SIZE_MAP, ModelArtifacts, ModelArtifactsInfo, WeightGroup,
WeightsManifestEntry} from './types';\n\n/** Number of bytes reserved for the length of the string. (32bit integer).
*/\nconst NUM_BYTES_STRING_LENGTH = 4;\n\n/**\n * Encode a map from names to weight values as an
ArrayBuffer, along with an\n * `Array` of `WeightsManifestEntry` as specification of the encoded weights.\n *\n * This function does not perform sharding.\n *\n * This function is the reverse of `decodeWeights`.\n *\n * @param
tensors A map (\"dict\") from names to tensors.\n * @param group Group to which the weights belong (optional).\n

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* @returns A `Promise` of\n * - A flat `ArrayBuffer` with all the binary values of the `Tensor`s\n *
concatenated.\n * - An `Array` of `WeightManifestEntry`s, carrying information including\n * tensor names,
`dtype`s and shapes.\n * @throws Error: on unsupported tensor `dtype`.\n */\nexport async function
encodeWeights(\n tensors: NamedTensorMap|NamedTensor[], group?: WeightGroup):\n Promise<{\n data:
ArrayBuffer, specs: WeightsManifestEntry[]}> {\n // TODO(adarob, cais): Support quantization.\n const specs:
WeightsManifestEntry[] = [];\n const dataPromises: Array<Promise<TypedArray>> = [];\n\n const names: string[]
= Array.isArray(tensors) ?\n tensors.map(tensor => tensor.name) :\n Object.keys(tensors);\n\n for (let i = 0; i
< names.length; ++i) {\n const name = names[i];\n const t = Array.isArray(tensors) ? tensors[i].tensor :\n tensors[name];\n if (t.dtype !== 'float32' && t.dtype !== 'int32' && t.dtype !== 'bool' &&\n t.dtype !==
'string' && t.dtype !== 'complex64') {\n throw new Error(`Unsupported dtype in weight '${name}':
${t.dtype}`);\n }\n const spec: WeightsManifestEntry = {name, shape: t.shape, dtype: t.dtype};\n if (t.dtype
=== 'string') {\n const utf8bytes = new Promise<TypedArray>(async resolve => {\n const vals = await
t.bytes() as Uint8Array[];\n const totalNumBytes = vals.reduce((p, c) => p + c.length, 0) +\n
NUM_BYTES_STRING_LENGTH * vals.length;\n const bytes = new Uint8Array(totalNumBytes);\n let
offset = 0;\n for (let i = 0; i < vals.length; i++) {\n const val = vals[i];\n const bytesOfLength =\n
new Uint8Array(new Uint32Array([val.length]).buffer);\n bytes.set(bytesOfLength, offset);\n offset
+= NUM_BYTES_STRING_LENGTH;\n bytes.set(val, offset);\n offset += val.length;\n }\n
resolve(bytes);\n });\n dataPromises.push(utf8bytes);\n } else {\n dataPromises.push(t.data());\n }\n if
(group != null) {\n spec.group = group;\n }\n specs.push(spec);\n }\n\n const tensorValues = await
Promise.all(dataPromises);\n return {data: concatenateTypedArrays(tensorValues), specs};\n}\n\n/**\n * Decode
flat ArrayBuffer as weights.\n *\n * This function does not handle sharding.\n *\n * This function is the reverse of
`encodeWeights`.\n *\n * @param buffer A flat ArrayBuffer carrying the binary values of the tensors\n *
concatenated in the order specified in `specs`.\n *\n * @param specs Specifications of the names, dtypes and shapes of
the tensors\n * whose value are encoded by `buffer`.\n *\n * @return A map from tensor name to tensor value, with the
names corresponding\n * to names in `specs`.\n *\n * @throws Error, if any of the tensors has unsupported dtype.\n
*/\nexport function decodeWeights(\n buffer: ArrayBuffer, specs: WeightsManifestEntry[]): NamedTensorMap
{\n // TODO(adarob, cais): Support quantization.\n const out: NamedTensorMap = {};\n let float16Decode:
(buffer: Uint16Array) => Float32Array | undefined;\n let offset = 0;\n for (const spec of specs) {\n const name =
spec.name;\n const dtype = spec.dtype;\n const shape = spec.shape;\n const size = sizeFromShape(shape);\n
let values: TypedArray|string[]|Uint8Array[];\n if ('quantization' in spec) {\n const quantization =
spec.quantization;\n if (quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n if (!('min' in
quantization && 'scale' in quantization)) {\n throw new Error(\n `Weight ${spec.name} with
quantization ${quantization.dtype} ` +\n `doesn't have corresponding metadata min and scale.`);\n }\n
} else if (quantization.dtype === 'float16') {\n if (dtype !== 'float32') {\n throw new Error(\n
`Weight ${spec.name} is quantized with ${quantization.dtype} ` +\n `which only supports weights of type
float32 not ${dtype}.`);\n }\n } else {\n throw new Error(\n `Weight ${spec.name} has unknown
` +\n `quantization dtype ${quantization.dtype}. ` +\n `Supported quantization dtypes are: ` +\n
`uint8`, 'uint16`, and 'float16`.`);\n }\n const quantizationSizeFactor =
DTYPE_VALUE_SIZE_MAP[quantization.dtype];\n const byteBuffer =\n buffer.slice(offset, offset + size
* quantizationSizeFactor);\n const quantizedArray = (quantization.dtype === 'uint8') ?\n new
Uint8Array(byteBuffer) :\n new Uint16Array(byteBuffer);\n if (dtype === 'float32') {\n if
(quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n values = new
Float32Array(quantizedArray.length);\n for (let i = 0; i < quantizedArray.length; i++) {\n const v =
quantizedArray[i];\n values[i] = v * quantization.scale + quantization.min;\n }\n } else if
(quantization.dtype === 'float16') {\n if (float16Decode === undefined) {\n float16Decode =
getFloat16Decoder();\n }\n values = float16Decode(quantizedArray as Uint16Array);\n } else {\n
throw new Error(\n `Unsupported quantization type ${quantization.dtype} ` +\n `for weight type
float32.`);\n }\n } else if (dtype === 'int32') {\n if (quantization.dtype !== 'uint8' && quantization.dtype

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!=='uint16') {\n throw new Error(\n `Unsupported quantization type ${quantization.dtype}` +\n `for weight type int32.`);\n }\n values = new Int32Array(quantizedArray.length);\n for (let i = 0; i <
quantizedArray.length; i++) {\n const v = quantizedArray[i];\n values[i] = Math.round(v *
quantization.scale + quantization.min);\n }\n } else {\n throw new Error(`Unsupported dtype in weight
`${name}`: ${dtype}`);\n }\n offset += size * quantizationSizeFactor;\n } else if (dtype === 'string') {\n const size = sizeFromShape(spec.shape);\n values = [];\n for (let i = 0; i < size; i++) {\n const byteLength
= new Uint32Array(\n buffer.slice(offset, offset + NUM_BYTES_STRING_LENGTH))[0];\n offset +=
NUM_BYTES_STRING_LENGTH;\n const bytes = new Uint8Array(buffer.slice(offset, offset +
byteLength));\n (values as Uint8Array[]).push(bytes);\n offset += byteLength;\n }\n } else {\n const
dtypeFactor = DTYPE_VALUE_SIZE_MAP[dtype];\n const byteBuffer = buffer.slice(offset, offset + size *
dtypeFactor);\n if (dtype === 'float32') {\n values = new Float32Array(byteBuffer);\n } else if (dtype
=== 'int32') {\n values = new Int32Array(byteBuffer);\n } else if (dtype === 'bool') {\n values = new
Uint8Array(byteBuffer);\n } else if (dtype === 'complex64') {\n values = new Float32Array(byteBuffer);\n const real = new Float32Array(values.length / 2);\n const image = new Float32Array(values.length / 2);\n for (let i = 0; i < real.length; i++) {\n real[i] = values[i * 2];\n image[i] = values[i * 2 + 1];\n }\n const realTensor = tensor(real, shape, 'float32');\n const imageTensor = tensor(image, shape, 'float32');\n out[name] = complex(realTensor, imageTensor);\n realTensor.dispose();\n imageTensor.dispose();\n }
else {\n throw new Error(`Unsupported dtype in weight `${name}`: ${dtype}`);\n }\n offset += size *
dtypeFactor;\n }\n if (dtype !== 'complex64') {\n out[name] = tensor(values, shape, dtype);\n }\n}\n}\nreturn out;\n}\n\n/**\n * Concatenate TypedArrays into an ArrayBuffer.\n */\nexport function
concatenateTypedArrays(xs: TypedArray[]): ArrayBuffer {\n // TODO(adarob, cais): Support quantization.\n if (xs
=== null) {\n throw new Error(`Invalid input value: ${JSON.stringify(xs)}`);\n }\n let totalByteLength = 0;\n // `normalizedXs` is here for this reason: a `TypedArray`s `buffer`\n // can have a different byte length from that of
the `TypedArray` itself,\n // for example, when the `TypedArray` is created from an offset in an\n // `ArrayBuffer`.\n `normliazedXs` holds `TypedArray`s whose `buffer`s match\n // the `TypedArray` in byte length. If an element of
`xs` does not show\n // this property, a new `TypedArray` that satisfy this property will be\n // constructed and
pushed into `normalizedXs`.\n const normalizedXs: TypedArray[] = [];\n xs.forEach((x: TypedArray) => {\n totalByteLength += x.byteLength;\n // tslint:disable:no-any\n normalizedXs.push(\n x.byteLength ===
x.buffer.byteLength ? x : \n new (x.constructor as any)(x);\n if (!(x as any instanceof
Float32Array || x as any instanceof Int32Array ||\n x as any instanceof Uint8Array)) {\n throw new
Error(`Unsupported TypedArray subtype: ${x.constructor.name}`);\n }\n // tslint:enable:no-any\n });\n const
y = new Uint8Array(totalByteLength);\n let offset = 0;\n normalizedXs.forEach((x: TypedArray) => {\n y.set(new Uint8Array(x.buffer), offset);\n offset += x.byteLength;\n });\n return y.buffer;\n}\n\n// Use Buffer
on Node.js instead of Blob/atob/btoa\nconst useNodeBuffer = typeof Buffer !== 'undefined' &&\n (typeof Blob
=== 'undefined' || typeof atob === 'undefined' ||\n typeof btoa === 'undefined');\n\n/**\n * Calculate the byte
length of a JavaScript string.\n * Note that a JavaScript string can contain wide characters, therefore the
length of the string is not necessarily equal to the byte length.\n * @param str Input string.\n * @returns Byte
length.\n */\nexport function stringByteLength(str: string): number {\n if (useNodeBuffer) {\n return
Buffer.byteLength(str);\n }\n return new Blob([str]).size;\n}\n\n/**\n * Encode an ArrayBuffer as a base64
encoded string.\n * @param buffer `ArrayBuffer` to be converted.\n * @returns A string that base64-encodes
`buffer`.\n */\nexport function arrayBufferToBase64String(buffer: ArrayBuffer): string {\n if (useNodeBuffer) {\n return Buffer.from(buffer).toString('base64');\n }\n const buf = new Uint8Array(buffer);\n let s = '';\n for (let i = 0,
l = buf.length; i < l; i++) {\n s += String.fromCharCode(buf[i]);\n }\n return btoa(s);\n}\n\n/**\n * Decode a
base64 string as an ArrayBuffer.\n * @param str Base64 string.\n * @returns Decoded `ArrayBuffer`.\n */\nexport function base64StringToArrayBuffer(str: string): ArrayBuffer {\n if (useNodeBuffer) {\n const buf =
Buffer.from(str, 'base64');\n return buf.buffer.slice(buf.byteOffset, buf.byteOffset + buf.byteLength);\n }\n const
s = atob(str);\n const buffer = new Uint8Array(s.length);\n for (let i = 0; i < s.length; ++i) {\n buffer.set([s.charCodeAtAt(i)], i);\n }\n return buffer.buffer;\n}\n\n/**\n * Concatenate a number of ArrayBuffers

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into one.\n *\n * @param buffers A number of array buffers to concatenate.\n * @returns Result of concatenating
`buffers` in order.\n *\nexport function concatenateArrayBuffers(buffers: ArrayBuffer[]): ArrayBuffer {\n if
(buffers.length === 1) {\n return buffers[0];\n }\n\n let totalByteLength = 0;\n buffers.forEach((buffer:
ArrayBuffer) => {\n totalByteLength += buffer.byteLength;\n });\n\n const temp = new
Uint8Array(totalByteLength);\n let offset = 0;\n buffers.forEach((buffer: ArrayBuffer) => {\n temp.set(new
Uint8Array(buffer), offset);\n offset += buffer.byteLength;\n });\n return temp.buffer;\n }\n\n/**\n * Get the
basename of a path.\n *\n * Behaves in a way analogous to Linux's basename command.\n *\n * @param path\n
*\nexport function basename(path: string): string {\n const SEPARATOR = '/';\n path = path.trim();\n while
(path.endsWith(SEPARATOR)) {\n path = path.slice(0, path.length - 1);\n }\n const items =
path.split(SEPARATOR);\n return items[items.length - 1];\n }\n\n/**\n * Populate ModelArtifactsInfo fields for a
model with JSON topology.\n * @param modelArtifacts\n * @returns A ModelArtifactsInfo object.\n *\nexport
function getModelArtifactsInfoForJSON(modelArtifacts: ModelArtifacts):\n ModelArtifactsInfo {\n if
(modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw new Error('Expected JSON model topology,
received ArrayBuffer.');http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns
Uint32Array, 2048 mantissa lookup values.\n *\nfunction computeFloat16MantisaTable(): Uint32Array {\n const
convertMantissa = (i: number): number => {\n let m = i << 13;\n let e = 0;\n\n while ((m & 0x00800000) ===
0) {\n e -= 0x00800000;\n m <<= 1;\n }\n m &= ~0x00800000;\n e += 0x38800000;\n\n return m | e;\n
};\n\n const mantisaTable = new Uint32Array(2048);\n\n mantisaTable[0] = 0;\n for (let i = 1; i < 1024; i++) {\n
mantisaTable[i] = convertMantissa(i);\n }\n\n for (let i = 1024; i < 2048; i++) {\n mantisaTable[i] = 0x38000000 +
((i - 1024) << 13);\n }\n\n return mantisaTable;\n }\n\n/**\n * Computes exponent table for casting Float16 to
Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns Uint32Array, 64
exponent lookup values.\n *\nfunction computeFloat16ExponentTable(): Uint32Array {\n const exponentTable =
new Uint32Array(64);\n\n exponentTable[0] = 0;\n exponentTable[31] = 0x47800000;\n exponentTable[32] =
0x80000000;\n exponentTable[63] = 0xc7800000;\n for (let i = 1; i < 31; i++) {\n exponentTable[i] = i << 23;\n
}\n\n for (let i = 33; i < 63; i++) {\n exponentTable[i] = 0x80000000 + ((i - 32) << 23);\n }\n\n return
exponentTable;\n }\n\n/**\n * Computes offset table for casting Float16 to Float32\n * See http://www.fox-
toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns Uint32Array, 6d offset values.\n *\nfunction
computeFloat16OffsetTable(): Uint32Array {\n const offsetTable = new Uint32Array(64);\n\n for (let i = 0; i < 64;
i++) {\n offsetTable[i] = 1024;\n }\n\n offsetTable[0] = offsetTable[32] = 0;\n return offsetTable;\n }\n\n/**\n *
Retrieve a Float16 decoder which will decode a ByteArray of Float16 values\n * to a Float32Array.\n *\n *
@returns Function (buffer: Uint16Array) => Float32Array which decodes\n * the Uint16Array of Float16
bytes to a Float32Array.\n *\nexport function getFloat16Decoder(): (buffer: Uint16Array) => Float32Array {\n //
Algorithm is based off of\n // http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n\n // Cache lookup
tables\n const mantisaTable = computeFloat16MantisaTable();\n const exponentTable =
computeFloat16ExponentTable();\n const offsetTable = computeFloat16OffsetTable();\n\n return (quantizedArray:
Uint16Array) => {\n const buffer = new ArrayBuffer(4 * quantizedArray.length);\n const bufferUint32View =
new Uint32Array(buffer);\n for (let index = 0; index < quantizedArray.length; index++) {\n const float16Bits =
quantizedArray[index];\n const float32Bits =\n mantisaTable[offsetTable[float16Bits >> 10]] + (float16Bits
& 0x3ff) +\n exponentTable[float16Bits >> 10];\n bufferUint32View[index] = float32Bits;\n }\n return
new Float32Array(buffer);\n };\n }\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *

```

<http://www.apache.org/licenses/LICENSE-2.0> Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

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*/\n\nimport {IOHandler, LoadOptions} from './types';\n\nexport type IORouter = (url: string|string[], loadOptions?: LoadOptions) =>\n IOHandler;\n\nexport class IORouterRegistry {\n // Singleton instance.\n private static instance: IORouterRegistry;\n\n private saveRouters: IORouter[];\n private loadRouters: IORouter[];\n\n private constructor() {\n this.saveRouters = [];\n this.loadRouters = [];\n }\n\n private static getInstance(): IORouterRegistry {\n if (IORouterRegistry.instance == null) {\n IORouterRegistry.instance = new IORouterRegistry();\n }\n return IORouterRegistry.instance;\n }\n\n /**\n * Register a save-handler router.\n *\n * @param saveRouter A function that maps a URL-like string onto an instance\n * of `IOHandler` with the `save` method defined or `null`.\n */\n static registerSaveRouter(saveRouter: IORouter) {\n IORouterRegistry.getInstance().saveRouters.push(saveRouter);\n }\n\n /**\n * Register a load-handler router.\n *\n * @param loadRouter A function that maps a URL-like string onto an instance\n * of `IOHandler` with the `load` method defined or `null`.\n */\n static registerLoadRouter(loadRouter: IORouter) {\n IORouterRegistry.getInstance().loadRouters.push(loadRouter);\n }\n\n /**\n * Look up IOHandler for saving, given a URL-like string.\n *\n * @param url\n * @returns If only one match is found, an instance of IOHandler with the\n * `save` method defined. If no match is found, `null`.\n * @throws Error, if more than one match is found.\n */\n static getSaveHandlers(url: string|string[]): IOHandler[] {\n return IORouterRegistry.getHandlers(url, 'save');\n }\n\n /**\n * Look up IOHandler for loading, given a URL-like string.\n *\n * @param url\n * @param loadOptions Optional, custom load options.\n * @returns All valid handlers for `url`, given the currently registered\n * handler routers.\n */\n static getLoadHandlers(url: string|string[], loadOptions?: LoadOptions):\n IOHandler[] {\n return IORouterRegistry.getHandlers(url, 'load', loadOptions);\n }\n\n private static getHandlers(\n url: string|string[], handlerType: 'save'|'load',\n loadOptions?: LoadOptions): IOHandler[] {\n const validHandlers: IOHandler[] = [];\n const routers = handlerType === 'load' ?\n IORouterRegistry.getInstance().loadRouters :\n IORouterRegistry.getInstance().saveRouters;\n routers.forEach(router => {\n const handler = router(url, loadOptions);\n if (handler !== null) {\n validHandlers.push(handler);\n }\n });\n return validHandlers;\n }\n\n export const registerSaveRouter = (loadRouter: IORouter) =>\n IORouterRegistry.registerSaveRouter(loadRouter);\n\n export const registerLoadRouter = (loadRouter: IORouter)\n =>\n IORouterRegistry.registerLoadRouter(loadRouter);\n\n export const getSaveHandlers = (url: string|string[])\n =>\n IORouterRegistry.getSaveHandlers(url);\n\n export const getLoadHandlers = (\n url: string|string[],\n loadOptions?: LoadOptions) =>\n IORouterRegistry.getLoadHandlers(url, loadOptions);\n\n /**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n}
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*/\n\nimport './flags';\n\nimport {env} from './environment';\n\nimport {getModelArtifactsInfoForJSON} from './io_utils';\n\nimport {IORouter, IORouterRegistry} from './router_registry';\n\nimport {IOHandler, ModelArtifacts, ModelArtifactsInfo, ModelStoreManager, SaveResult} from './types';\n\nconst DATABASE_NAME = 'tensorflowjs';\nconst DATABASE_VERSION = 1;\n\n// Model data and ModelArtifactsInfo (metadata) are stored in two separate\n// stores for efficient access of the list of stored models and their metadata.\n// 1. The object store for model data: topology, weights and weight manifests.\nconst MODEL_STORE_NAME = 'models_store';\n// 2. The object store for ModelArtifactsInfo, including meta-information such\n// as the type of topology (JSON vs
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binary), byte size of the topology, byte\n// size of the weights, etc.\nconst INFO_STORE_NAME =
'model_info_store';\n\n/**\n * Delete the entire database for tensorflow.js, including the models store.\n */\nexport
async function deleteDatabase(): Promise<void> {\n const idbFactory = getIndexedDBFactory();\n\n return new
Promise<void>((resolve, reject) => {\n const deleteRequest =
idbFactory.deleteDatabase(DATABASE_NAME);\n deleteRequest.onsuccess = () => resolve();\n
deleteRequest.onerror = error => reject(error);\n });\n}\n\nfunction getIndexedDBFactory(): IDBFactory {\n if
(!env().getBool('IS_BROWSER')) {\n // TODO(cais): Add more info about what IOHandler subtypes are
available.\n // Maybe point to a doc page on the web and/or automatically determine\n // the available
IOHandlers and print them in the error message.\n throw new Error(\n 'Failed to obtain IndexedDB factory
because the current environment' +\n ' is not a web browser.');

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putInfoRequest.onsuccess = () => {\n // Second, put model data into model store.\n modelTx =
db.transaction(MODEL_STORE_NAME, 'readwrite');\n const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n const putModelRequest = modelStore.put({\n
modelPath: this.modelPath,\n modelArtifacts,\n modelArtifactsInfo\n });\n
putModelRequest.onsuccess = () => resolve({modelArtifactsInfo});\n putModelRequest.onerror = error =>
{\n // If the put-model request fails, roll back the info entry as\n // well.\n infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n const deleteInfoRequest =
infoStore.delete(this.modelPath);\n deleteInfoRequest.onsuccess = () => {\n db.close();\n
return reject(putModelRequest.error);\n };\n deleteInfoRequest.onerror = error => {\n
db.close();\n return reject(putModelRequest.error);\n };\n };\n };\n
putInfoRequest.onerror = error => {\n db.close();\n return reject(putInfoRequest.error);\n };\n
infoTx.oncomplete = () => {\n if (modelTx == null) {\n db.close();\n } else {\n
modelTx.oncomplete = () => db.close();\n }\n };\n };\n };\n openRequest.onerror = error =>
reject(openRequest.error);\n };\n };\n };\n };\n };\n };\n };\n
}\n\nexport const indexedDBRouter: IORouter = (url: string|string[]) => {\n
if (!env().getBool('IS_BROWSER')) {\n return null;\n } else {\n if (!Array.isArray(url) &&
url.startsWith(BrowserIndexedDB.URL_SCHEME)) {\n return
browserIndexedDB(url.slice(BrowserIndexedDB.URL_SCHEME.length));\n } else {\n return null;\n }\n
}\n\nIORouterRegistry.registerSaveRouter(indexedDBRouter);\nIORouterRegistry.registerLoadRouter(indexedD
BRouter);\n\n/**\n * Creates a browser IndexedDB IOHandler for saving and loading models.\n *\n * ```\n * const
model = tf.sequential();\n * model.add(\n * tf.layers.dense({ units: 1, inputShape: [100], activation: 'sigmoid' }));\n *
*\n * const saveResult = await model.save('indexeddb://MyModel');\n * console.log(saveResult);\n * ```\n *\n *
@param modelPath A unique identifier for the model to be saved. Must be a\n * non-empty string.\n * @returns
An instance of `BrowserIndexedDB` (subclass of `IOHandler`),\n * which can be used with, e.g.,
`tf.Model.save`.\n * ^\nexport function browserIndexedDB(modelPath: string): IOHandler {\n return new
BrowserIndexedDB(modelPath);\n }\n\nfunction maybeStripScheme(key: string) {\n return
key.startsWith(BrowserIndexedDB.URL_SCHEME) ?\n key.slice(BrowserIndexedDB.URL_SCHEME.length)
:\n key;\n }\n\nexport class BrowserIndexedDBManager implements ModelStoreManager {\n private
indexedDB: IDBFactory;\n\n constructor() {\n this.indexedDB = getIndexedDBFactory();\n }\n\n async
listModels(): Promise<[[path: string]: ModelArtifactsInfo]> {\n return new Promise<[[path: string]:
ModelArtifactsInfo]>(\n (resolve, reject) => {\n const openRequest =\n
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n openRequest.onupgradeneeded = ()
=> setUpDatabase(openRequest);\n\n openRequest.onsuccess = () => {\n const db =
openRequest.result;\n const tx = db.transaction(INFO_STORE_NAME, 'readonly');\n const store =
tx.objectStore(INFO_STORE_NAME);\n // tslint:disable:max-line-length\n // Need to cast `store` as
`any` here because TypeScript's DOM\n // library does not have the `getAll()` method even though the\n
// method is supported in the latest version of most mainstream\n // browsers;\n //
https://developer.mozilla.org/en-US/docs/Web/API/IDBObjectStore/getAll\n // tslint:enable:max-line-
length\n // tslint:disable-next-line:no-any\n const getAllInfoRequest = (store as any).getAll() as
IDBRequest;\n getAllInfoRequest.onsuccess = () => {\n const out: [[path: string]:
ModelArtifactsInfo] = {};\n for (const item of getAllInfoRequest.result) {\n out[item.modelPath]
= item.modelArtifactsInfo;\n }\n resolve(out);\n };\n getAllInfoRequest.onerror =
error => {\n db.close();\n return reject(getAllInfoRequest.error);\n };\n tx.oncomplete
= () => db.close();\n };\n openRequest.onerror = error => reject(openRequest.error);\n };\n };\n }\n\n async removeModel(path: string): Promise<ModelArtifactsInfo> {\n path = maybeStripScheme(path);\n return
new Promise<ModelArtifactsInfo>((resolve, reject) => {\n const openRequest =
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n openRequest.onupgradeneeded = () =>
setUpDatabase(openRequest);\n\n openRequest.onsuccess = () => {\n const db = openRequest.result;\n
const infoTx = db.transaction(INFO_STORE_NAME, 'readwrite');\n const infoStore =

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infoTx.objectStore(INFO_STORE_NAME);\n\n const getInfoRequest = infoStore.get(path);\n\n let modelTx:
IDBTransaction;\n getInfoRequest.onsuccess = () => {\n if (getInfoRequest.result == null) {\n
db.close();\n return reject(new Error(\n `Cannot find model with path '${path}'` +\n `in
IndexedDB.`));\n } else {\n // First, delete the entry in the info store.\n const deleteInfoRequest =
infoStore.delete(path);\n const deleteModelData = () => {\n // Second, delete the entry in the model
store.\n modelTx = db.transaction(MODEL_STORE_NAME, 'readwrite');\n const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n const deleteModelRequest = modelStore.delete(path);\n
 deleteModelRequest.onsuccess = () =>\n resolve(getInfoRequest.result.modelArtifactsInfo);\n
 deleteModelRequest.onerror = error =>\n reject(getInfoRequest.error);\n };\n // Proceed
with deleting model data regardless of whether deletion\n // of info data succeeds or not.\n deleteInfoRequest.onsuccess = deleteModelData;\n deleteInfoRequest.onerror = error => {\n
 deleteModelData();\n db.close();\n return reject(getInfoRequest.error);\n };\n }\n
};\n getInfoRequest.onerror = error => {\n db.close();\n return reject(getInfoRequest.error);\n
};\n\n infoTx.oncomplete = () => {\n if (modelTx == null) {\n db.close();\n } else {\n
modelTx.oncomplete = () => db.close();\n }\n };\n openRequest.onerror = error =>
reject(openRequest.error);\n });\n }\n}\n\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport './flags';\nimport {env} from './environment';\n\nimport {assert} from './util';\nimport
{arrayBufferToBase64String, base64StringToArrayBuffer, getModelArtifactsInfoForJSON} from
 './io_utils';\nimport {IORouter, IORouterRegistry} from './router_registry';\nimport {IOHandler, ModelArtifacts,
ModelArtifactsInfo, ModelStoreManager, SaveResult} from './types';\n\nconst PATH_SEPARATOR = '/';\nconst
PATH_PREFIX = 'tensorflowjs_models';\nconst INFO_SUFFIX = 'info';\nconst MODEL_TOPOLOGY_SUFFIX =
'model_topology';\nconst WEIGHT_SPECS_SUFFIX = 'weight_specs';\nconst WEIGHT_DATA_SUFFIX =
'weight_data';\nconst MODEL_METADATA_SUFFIX = 'model_metadata';\n\n/**\n * Purge all tensorflow.js-
saved model artifacts from local storage.\n * @returns Paths of the models purged.\n */\nexport function
purgeLocalStorageArtifacts(): string[] {\n if (!env().getBool('IS_BROWSER') || typeof window === 'undefined' ||\n
typeof window.localStorage === 'undefined') {\n throw new Error(\n 'purgeLocalStorageModels() cannot
proceed because local storage is ' +\n 'unavailable in the current environment.);\n }\n const LS =
window.localStorage;\n const purgedModelPaths: string[] = [];\n for (let i = 0; i < LS.length; ++i) {\n const key =
LS.key(i);\n const prefix = PATH_PREFIX + PATH_SEPARATOR;\n if (key.startsWith(prefix) && key.length
> prefix.length) {\n LS.removeItem(key);\n const modelName = getModelPathFromKey(key);\n if
(purgedModelPaths.indexOf(modelName) === -1) {\n purgedModelPaths.push(modelName);\n }\n }\n
 }\n return purgedModelPaths;\n}\n\nfunction getModelKeys(path: string): {\n info: string,\n topology: string,\n
weightSpecs: string,\n weightData: string,\n modelMetadata: string\n} {\n return {\n info: [PATH_PREFIX,
path, INFO_SUFFIX].join(PATH_SEPARATOR),\n topology: [PATH_PREFIX, path,
MODEL_TOPOLOGY_SUFFIX].join(PATH_SEPARATOR),\n weightSpecs: [PATH_PREFIX, path,
WEIGHT_SPECS_SUFFIX].join(PATH_SEPARATOR),\n weightData: [PATH_PREFIX, path,
WEIGHT_DATA_SUFFIX].join(PATH_SEPARATOR),\n modelMetadata: [PATH_PREFIX, path,
MODEL_METADATA_SUFFIX].join(PATH_SEPARATOR)\n };\n}\n\n/**\n * Get model path from a local-
storage key.\n * E.g., 'tensorflowjs_models/my/model/1/info' --> 'my/model/1'\n * @param key\n */\nfunction getModelPathFromKey(key: string) {\n const items = key.split(PATH_SEPARATOR);\n if
(items.length < 3) {\n throw new Error(`Invalid key format: ${key}`);\n }\n return items.slice(1, items.length -

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1).join(PATH_SEPARATOR);\n}\n\nfunction maybeStripScheme(key: string) {\n return
key.startsWith(BrowserLocalStorage.URL_SCHEME) ?\n
key.slice(BrowserLocalStorage.URL_SCHEME.length) :\n key;\n}\n\n// declare type LocalStorageKeys = {\n
info: string,\n topology: string,\n weightSpecs: string,\n weightData: string,\n modelMetadata: string\n};\n\n/**\n * IOHandler subclass: Browser Local Storage.\n * See the doc string to `browserLocalStorage` for more
details.\n */\nexport class BrowserLocalStorage implements IOHandler {\n protected readonly LS: Storage;\n
protected readonly modelPath: string;\n protected readonly keys: LocalStorageKeys;\n\n static readonly
URL_SCHEME = 'localStorage://';\n\n constructor(modelPath: string) {\n if (!env().getBool('IS_BROWSER') ||
typeof window === 'undefined' ||\n typeof window.localStorage === 'undefined') {\n // TODO(cais): Add
more info about what IOHandler subtypes are\n // available.\n // Maybe point to a doc page on the web
and/or automatically determine\n // the available IOHandlers and print them in the error message.\n throw
new Error(\n 'The current environment does not support local storage.);\n }\n this.LS =
window.localStorage;\n\n if (modelPath == null || !modelPath) {\n throw new Error(\n 'For local storage,
modelPath must not be null, undefined or empty.);\n }\n this.modelPath = modelPath;\n this.keys =
getModelKeys(this.modelPath);\n }\n\n /**\n * Save model artifacts to browser local storage.\n * See the
documentation to `browserLocalStorage` for details on the saved\n * artifacts.\n * @param modelArtifacts
The model artifacts to be stored.\n * @returns An instance of SaveResult.\n */\n async save(modelArtifacts:
ModelArtifacts): Promise<SaveResult> {\n if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw
new Error(\n 'BrowserLocalStorage.save() does not support saving model topology ' +\n 'in binary
formats yet.);\n } else {\n const topology = JSON.stringify(modelArtifacts.modelTopology);\n const
weightSpecs = JSON.stringify(modelArtifacts.weightSpecs);\n\n const modelArtifactsInfo: ModelArtifactsInfo
=\n getModelArtifactsInfoForJSON(modelArtifacts);\n\n try {\n this.LS.setItem(this.keys.info,
JSON.stringify(modelArtifactsInfo));\n this.LS.setItem(this.keys.topology, topology);\n this.LS.setItem(this.keys.weightSpecs, weightSpecs);\n this.LS.setItem(\n this.keys.weightData,\n arrayBufferToBase64String(modelArtifacts.weightData));\n const result: ModelArtifacts = {\n format:
modelArtifacts.format,\n generatedBy: modelArtifacts.generatedBy,\n convertedBy:
modelArtifacts.convertedBy\n }; \n if (modelArtifacts.signature != null) {\n result.signature =
modelArtifacts.signature;\n }\n if (modelArtifacts.userDefinedMetadata != null) {\n result.userDefinedMetadata = modelArtifacts.userDefinedMetadata;\n }\n if
(modelArtifacts.modelInitializer != null) {\n result.modelInitializer = modelArtifacts.modelInitializer;\n }\n this.LS.setItem(this.keys.modelMetadata, JSON.stringify(result));\n\n return {modelArtifactsInfo};\n } catch (err) {\n // If saving failed, clean up all items saved so far.\n this.LS.removeItem(this.keys.info);\n this.LS.removeItem(this.keys.topology);\n this.LS.removeItem(this.keys.weightSpecs);\n this.LS.removeItem(this.keys.weightData);\n this.LS.removeItem(this.keys.modelMetadata);\n\n throw new
Error(\n `Failed to save model '${this.modelPath}' to local storage: ` +\n `size quota being exceeded is
a possible cause of this failure: ` +\n `modelTopologyBytes=${modelArtifactsInfo.modelTopologyBytes}, ` +\n `weightSpecsBytes=${modelArtifactsInfo.weightSpecsBytes}, ` +\n `weightDataBytes=${modelArtifactsInfo.weightDataBytes}.`);\n }\n }\n }\n\n /**\n * Load a model from
local storage.\n * See the documentation to `browserLocalStorage` for details on the saved\n * artifacts.\n * @returns The loaded model (if loading succeeds).\n */\n async load(): Promise<ModelArtifacts> {\n const info =\n JSON.parse(this.LS.getItem(this.keys.info)) as ModelArtifactsInfo;\n if (info == null) {\n throw new Error(\n `In local storage, there is no model with name '${this.modelPath}'`);\n }\n if
(info.modelTopologyType !== 'JSON') {\n throw new Error(\n 'BrowserLocalStorage does not support
loading non-JSON model ' +\n 'topology yet.);\n }\n const out: ModelArtifacts = {};\n\n // Load
topology.\n const topology = JSON.parse(this.LS.getItem(this.keys.topology));\n if (topology == null) {\n throw
new Error(\n `In local storage, the topology of model '${this.modelPath}' ` +\n `is missing.);\n }\n out.modelTopology = topology;\n\n // Load weight specs.\n const weightSpecs =
JSON.parse(this.LS.getItem(this.keys.weightSpecs));\n if (weightSpecs == null) {\n throw new Error(\n

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`In local storage, the weight specs of model '${this.modelPath}' +\n `are missing.`);\n }\n out.weightSpecs = weightSpecs;\n // Load meta-data fields.\n const metadataString =\n this.LS.getItem(this.keys.modelMetadata);\n if (metadataString != null) {\n const metadata =\n JSON.parse(metadataString) as ModelArtifacts;\n out.format = metadata['format'];\n out.generatedBy =\n metadata['generatedBy'];\n out.convertedBy = metadata['convertedBy'];\n if (metadata['signature'] != null) {\n out.signature = metadata['signature'];\n }\n if (metadata['userDefinedMetadata'] != null) {\n out.userDefinedMetadata = metadata['userDefinedMetadata'];\n }\n if (metadata['modelInitializer'] != null) {\n out.modelInitializer = metadata['modelInitializer'];\n }\n }\n // Load weight data.\n const\n weightDataBase64 = this.LS.getItem(this.keys.weightData);\n if (weightDataBase64 == null) {\n throw new\n Error(\n `In local storage, the binary weight values of model ` +\n `${this.modelPath}` are missing.`);\n }\n out.weightData = base64StringToArrayBuffer(weightDataBase64);\n return out;\n }\n}\n\nexport const\nlocalStorageRouter: IORouter = (url: string|string[]) => {\n if (!env().getBool('IS_BROWSER')) {\n return null;\n } else {\n if (!Array.isArray(url) && url.startsWith(BrowserLocalStorage.URL_SCHEME)) {\n return\n browserLocalStorage(\n url.slice(BrowserLocalStorage.URL_SCHEME.length));\n } else {\n return\n null;\n }\n }\n}\n\nIORouterRegistry.registerSaveRouter(localStorageRouter);\nIORouterRegistry.registerLoadRouter(localStorageRouter);\n\n/**\n * Factory function for local storage IOHandler.\n *\n * This `IOHandler` supports both `save`\n and `load`.\n *\n * For each model's saved artifacts, four items are saved to local storage.\n * -\n * `${PATH_SEPARATOR}/${modelPath}/info`: Contains meta-info about the\n * model, such as date saved, type\n of the topology, size in bytes, etc.\n * - `${PATH_SEPARATOR}/${modelPath}/topology`: Model topology. For\n * Keras-\n * style models, this is a stringized JSON.\n * -\n * `${PATH_SEPARATOR}/${modelPath}/weight_specs`: Weight specs of the\n * model, can be used to decode\n the saved binary weight values (see\n * item below).\n * -\n * `${PATH_SEPARATOR}/${modelPath}/weight_data`: Concatenated binary\n * weight values, stored as a\n base64-encoded string.\n *\n * Saving may throw an `Error` if the total size of the artifacts exceed the\n * browser-\n specific quota.\n *\n * @param modelPath A unique identifier for the model to be saved. Must be a\n * non-empty\n string.\n *\n * @returns An instance of `IOHandler`, which can be used with, e.g.,\n * `tf.Model.save`.\n */\nexport\nfunction browserLocalStorage(modelPath: string): IOHandler {\n return new\n BrowserLocalStorage(modelPath);\n}\n\nexport class BrowserLocalStorageManager implements\nModelStoreManager {\n private readonly LS: Storage;\n\n constructor() {\n assert(\n env().getBool('IS_BROWSER'),\n () => 'Current environment is not a web browser');\n assert(\n typeof\n window === 'undefined' ||\n typeof window.localStorage !== 'undefined',\n () => 'Current browser does\n not appear to support localStorage');\n this.LS = window.localStorage;\n }\n\n async listModels():\n Promise<[[path: string]: ModelArtifactsInfo]> {\n const out: [[path: string]: ModelArtifactsInfo] = {};\n const\n prefix = PATH_PREFIX + PATH_SEPARATOR;\n const suffix = PATH_SEPARATOR + INFO_SUFFIX;\n for (let i = 0; i < this.LS.length; ++i) {\n const key = this.LS.key(i);\n if (key.startsWith(prefix) &&\n key.endsWith(suffix)) {\n const modelPath = getModelPathFromKey(key);\n out[modelPath] =\n JSON.parse(this.LS.getItem(key)) as ModelArtifactsInfo;\n }\n }\n return out;\n }\n\n async\n removeModel(path: string): Promise<ModelArtifactsInfo> {\n path = maybeStripScheme(path);\n const keys =\n getModelKeys(path);\n if (this.LS.getItem(keys.info) == null) {\n throw new Error(`Cannot find model at path\n '${path}'`);\n }\n const info = JSON.parse(this.LS.getItem(keys.info)) as ModelArtifactsInfo;\n this.LS.removeItem(keys.info);\n this.LS.removeItem(keys.topology);\n this.LS.removeItem(keys.weightSpecs);\n this.LS.removeItem(keys.weightData);\n return info;\n }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

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the specific language governing permissions and limitations under the License.

```
=====
*/ Classes and functions for model management across multiple storage mediums.
Supported client actions:
- Listing models on all registered storage mediums.
- Remove model by URL from any registered storage mediums, by using URL
string
- Moving or copying model from one path to another in the same medium or from one medium to another, by using URL strings.
*/
import {assert} from './util';
import {IORouterRegistry} from './router_registry';
import {ModelArtifactsInfo, ModelStoreManager} from './types';
const URL_SCHEME_SUFFIX = '://';
export class ModelStoreManagerRegistry {
// Singleton instance.
private static instance: ModelStoreManagerRegistry;
private managers: {[scheme: string]: ModelStoreManager};

private constructor() {
this.managers = {};
}

private static getInstance(): ModelStoreManagerRegistry {
if (ModelStoreManagerRegistry.instance == null) {
ModelStoreManagerRegistry.instance = new ModelStoreManagerRegistry();
}
return ModelStoreManagerRegistry.instance;
}

/**
 * Register a save-handler router.
 * @param saveRouter A function that maps a URL-like string onto an instance of `IOHandler` with the `save` method defined or `null`.
 */
static registerManager(scheme: string, manager: ModelStoreManager) {
assert(scheme != null, () => 'scheme must not be undefined or null. ');
if (scheme.endsWith(URL_SCHEME_SUFFIX)) {
scheme = scheme.slice(0, scheme.indexOf(URL_SCHEME_SUFFIX));
}
assert(scheme.length > 0, () => 'scheme must not be an empty string. ');
const registry = ModelStoreManagerRegistry.getInstance();
assert(registry.managers[scheme] == null, () => `A model store manager is already registered for scheme '${scheme}'.`);
registry.managers[scheme] = manager;
}

static getManager(scheme: string): ModelStoreManager {
const manager = this.getInstance().managers[scheme];
if (manager == null) {
throw new Error(`Cannot find model manager for scheme '${scheme}'`);
}
return manager;
}

static getSchemes(): string[] {
return Object.keys(this.getInstance().managers);
}

/**
 * Helper method for parsing a URL string into a scheme and a path.
 * @param url E.g., 'localStorage://my-model'
 * @returns A dictionary with two fields: scheme and path.
 * Scheme: e.g., 'localStorage' in the example above.
 * Path: e.g., 'my-model' in the example above.
 */
function parseURL(url: string): {scheme: string, path: string} {
if (url.indexOf(URL_SCHEME_SUFFIX) === -1) {
throw new Error(`The url string provided does not contain a scheme. ` +
`Supported schemes are: ` +
`${ModelStoreManagerRegistry.getSchemes().join(',')}`);
}
return {
scheme: url.split(URL_SCHEME_SUFFIX)[0],
path: url.split(URL_SCHEME_SUFFIX)[1],
};
}

async function cloneModelInternal(sourceURL: string, destURL: string, deleteSource = false): Promise<ModelArtifactsInfo> {
assert(sourceURL !== destURL, () => `Old path and new path are the same: '${sourceURL}'`);
const loadHandlers = IORouterRegistry.getLoadHandlers(sourceURL);
assert(loadHandlers.length > 0, () => `Copying failed because no load handler is found for source URL ${sourceURL}.`);
assert(loadHandlers.length < 2, () => `Copying failed because more than one (${loadHandlers.length}) ` +
`load handlers for source URL ${sourceURL}.`);
const loadHandler = loadHandlers[0];
const saveHandlers = IORouterRegistry.getSaveHandlers(destURL);
assert(saveHandlers.length > 0, () => `Copying failed because no save handler is found for destination ` +
`URL ${destURL}.`);
assert(saveHandlers.length < 2, () => `Copying failed because more than one (${loadHandlers.length}) ` +
`save handlers for destination URL ${destURL}.`);
const saveHandler = saveHandlers[0];
const sourceScheme = parseURL(sourceURL).scheme;
const sourcePath = parseURL(sourceURL).path;
const sameMedium = sourceScheme === parseURL(destURL).scheme;
const modelArtifacts = await loadHandler.load();
// If moving within the same storage medium, remove the old model as soon as the loading is done. Without doing this, it is possible that the combined size of the two models will cause the cloning to fail.
if (deleteSource && sameMedium) {
await ModelStoreManagerRegistry.getManager(sourceScheme).removeModel(sourcePath);
}
const saveResult = await saveHandler.save(modelArtifacts);
// If moving between mediums, the deletion is done after the save succeeds. This guards against the case in which saving to the destination medium fails.
if
```

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(deleteSource && !sameMedium) {\n await ModelStoreManagerRegistry.getManager(sourceScheme)\n .removeModel(sourcePath);\n } \n\n return saveResult.modelArtifactsInfo;\n}\n\n/**\n * List all models stored in registered storage mediums.\n *\n * For a web browser environment, the registered mediums are Local Storage and\n * IndexedDB.\n *\n * ```js\n * // First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n * {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localStorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Delete the model.\n * await tf.io.removeModel('localStorage://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n * ```\n *\n * @returns A `Promise` of a dictionary mapping URLs of existing models to\n * their model artifacts info. URLs include medium-specific schemes, e.g.,\n * 'indexeddb://my/model/1'. Model artifacts info include type of the\n * model's topology, byte sizes of the topology, weights, etc.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Management',\n * namespace: 'io',\n * ignoreCI: true\n * }\n *\n * ^\n * nasync function listModels(): Promise<{[url: string]: ModelArtifactsInfo}> {\n * const schemes = ModelStoreManagerRegistry.getSchemes();\n * const out: {[url: string]: ModelArtifactsInfo} = {};\n * for (const scheme of schemes) {\n * const schemeOut =\n * await ModelStoreManagerRegistry.getManager(scheme).listModels();\n * for (const path in schemeOut) {\n * const url =\n * scheme + URL_SCHEME_SUFFIX + path;\n * out[url] = schemeOut[path];\n * }\n * }\n * return out;\n * }\n\n /**\n * Remove a model specified by URL from a registered storage medium.\n *\n * ```js\n * // First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n * {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localStorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Delete the model.\n * await tf.io.removeModel('localStorage://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n * ```\n *\n * @param url A URL to a stored model, with a scheme prefix, e.g.,\n * 'localStorage://my-model-1', 'indexeddb://my/model/2'.\n *\n * @returns ModelArtifactsInfo of the deleted model (if and only if deletion\n * is successful).\n *\n * @throws Error if deletion fails, e.g., if no model exists at `path`.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Management',\n * namespace: 'io',\n * ignoreCI: true\n * }\n *\n * ^\n * nasync function removeModel(url: string): Promise<ModelArtifactsInfo> {\n * const schemeAndPath = parseURL(url);\n * const manager = ModelStoreManagerRegistry.getManager(schemeAndPath.scheme);\n * return manager.removeModel(schemeAndPath.path);\n * }\n\n /**\n * Copy a model from one URL to another.\n *\n * This function supports:\n *\n * 1. Copying within a storage medium, e.g.,\n * `tf.io.copyModel('localStorage://model-1', 'localStorage://model-2')`\n *\n * 2. Copying between two storage mediums, e.g.,\n * `tf.io.copyModel('localStorage://model-1', 'indexeddb://model-1')`\n *\n * ```js\n * // First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n * {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localStorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Copy the model, from Local Storage to IndexedDB.\n * await tf.io.copyModel(\n * 'localStorage://demo/management/model1',\n * 'indexeddb://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Remove both models.\n * await tf.io.removeModel('localStorage://demo/management/model1');\n * await tf.io.removeModel('indexeddb://demo/management/model1');\n * ```\n *\n * @param sourceURL Source URL of copying.\n * @param destURL Destination URL of copying.\n * @returns ModelArtifactsInfo of the copied model (if and only if copying\n * is successful).\n *\n * @throws Error if copying fails, e.g., if no model exists at `sourceURL`, or\n * if `oldPath` and `newPath` are identical.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Management',\n * namespace: 'io',\n * ignoreCI: true\n * }\n *\n * ^\n * nasync function copyModel(\n * sourceURL: string, destURL: string): Promise<ModelArtifactsInfo> {\n * const deleteSource = false;\n * return cloneModelInternal(sourceURL, destURL, deleteSource);\n * }\n\n /**\n * Move a model from one URL to another.\n *\n * This function supports:\n *\n * 1. Moving within a storage medium, e.g.,\n *

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tf.io.moveModel('localstorage://model-1', 'localstorage://model-2')`n * 2. Moving between two storage mediums,
e.g.,`n * `tf.io.moveModel('localstorage://model-1', 'indexeddb://model-1')`n *`n * ``js`n * // First create and save
a model.`n * const model = tf.sequential();`n * model.add(tf.layers.dense(`n * {units: 1, inputShape: [10],
activation: 'sigmoid'}));`n * await model.save('localstorage://demo/management/model1');`n *`n * // Then list
existing models.`n * console.log(JSON.stringify(await tf.io.listModels()));`n *`n * // Move the model, from Local
Storage to IndexedDB.`n * await tf.io.moveModel(`n * 'localstorage://demo/management/model1',`n *
'indexeddb://demo/management/model1');`n *`n * // List models again.`n * console.log(JSON.stringify(await
tf.io.listModels()));`n *`n * // Remove the moved model.`n * await
tf.io.removeModel('indexeddb://demo/management/model1');`n * ```n *`n * @param sourceURL Source URL of
moving.`n * @param destURL Destination URL of moving.`n * @returns ModelArtifactsInfo of the copied model
(if and only if copying`n * is successful).`n * @throws Error if moving fails, e.g., if no model exists at
`sourceURL`, or`n * if `oldPath` and `newPath` are identical.`n *`n * @doc {`n * heading: 'Models',`n *
subheading: 'Management',`n * namespace: 'io',`n * ignoreCI: true`n * }`n *`n * ^nasync function moveModel(`n
sourceURL: string, destURL: string): Promise<ModelArtifactsInfo> {`n const deleteSource = true;`n return
cloneModelInternal(sourceURL, destURL, deleteSource);`n}`n`nexport {moveModel, copyModel, removeModel,
listModels};`n",`n *`n * @license`n * Copyright 2019 Google LLC. All Rights Reserved.`n * Licensed under the
Apache License, Version 2.0 (the "License");`n * you may not use this file except in compliance with the
License.`n * You may obtain a copy of the License at`n *`n * http://www.apache.org/licenses/LICENSE-2.0`n *`n *
Unless required by applicable law or agreed to in writing, software`n * distributed under the License is distributed
on an "AS IS" BASIS,`n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.`n * See the License for the specific language governing permissions and`n * limitations under the
License.`n *

```

```

=====`n
*`n`nimport './flags';`nimport {env} from './environment';`nimport {BrowserIndexedDB,
BrowserIndexedDBManager} from './io/indexed_db';`nimport {BrowserLocalStorage,
BrowserLocalStorageManager} from './io/local_storage';`nimport {ModelStoreManagerRegistry} from
'./io/model_management';`nimport {Platform} from './platform';`nexport class PlatformBrowser implements
Platform {`n // According to the spec, the built-in encoder can do only UTF-8 encoding.`n //
https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder`n private textEncoder:
TextEncoder;`n`n fetch(path: string, init?: RequestInit): Promise<Response> {`n return fetch(path, init);`n }`n`n
now(): number {`n return performance.now();`n }`n`n encode(text: string, encoding: string): Uint8Array {`n if
(encoding !== 'utf-8' && encoding !== 'utf8') {`n throw new Error(`n `Browser's encoder only supports utf-
8, but got ${encoding}`);`n }`n if (this.textEncoder == null) {`n this.textEncoder = new TextEncoder();`n
}`n return this.textEncoder.encode(text);`n }`n decode(bytes: Uint8Array, encoding: string): string {`n return
new TextDecoder(encoding).decode(bytes);`n }`n}`n`nif (env().get('IS_BROWSER')) {`n
env().setPlatform('browser', new PlatformBrowser());`n // Register LocalStorage IOHandler`n try {`n
ModelStoreManagerRegistry.registerManager(`n BrowserLocalStorage.URL_SCHEME, new
BrowserLocalStorageManager());`n } catch (err) {`n }`n`n // Register IndexedDB IOHandler`n try {`n
ModelStoreManagerRegistry.registerManager(`n BrowserIndexedDB.URL_SCHEME, new
BrowserIndexedDBManager());`n } catch (err) {`n }`n}`n",`n *`n * @license`n * Copyright 2019 Google LLC. All
Rights Reserved.`n * Licensed under the Apache License, Version 2.0 (the "License");`n * you may not use this
file except in compliance with the License.`n * You may obtain a copy of the License at`n *`n *
http://www.apache.org/licenses/LICENSE-2.0`n *`n * Unless required by applicable law or agreed to in writing,
software`n * distributed under the License is distributed on an "AS IS" BASIS,`n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.`n * See the License for the specific language
governing permissions and`n * limitations under the License.`n *

```

```

=====`n
*`nimport {env} from './environment';`nimport {Platform} from './platform';`n`n// We are wrapping this within an

```

```

object so it can be stubbed by Jasmine.\nexport const getNodeFetch = {\n // tslint:disable-next-line:no-require-
imports\n importFetch: () => require('node-fetch')\n};\n\ntype FetchFn = (url: string, init?: RequestInit) =>
Promise<Response>;\nlet systemFetch: FetchFn;\n// These getters and setters are for testing so we don't export a
mutable\n// variable.\nexport function resetSystemFetch() {\n systemFetch = null;\n}\nexport function
setSystemFetch(fetchFn: FetchFn) {\n systemFetch = fetchFn;\n}\nexport function getSystemFetch(): FetchFn {\n
return systemFetch;\n}\n\nexport class PlatformNode implements Platform {\n private textEncoder: TextEncoder;\n
// tslint:disable-next-line:no-any\n util: any;\n\n constructor() {\n // tslint:disable-next-line:no-require-imports\n
this.util = require('util');\n // According to the spec, the built-in encoder can do only UTF-8 encoding.\n //
https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder\n this.textEncoder = new
this.util.TextEncoder();\n }\n\n fetch(path: string, requestInits?: RequestInit): Promise<Response> {\n if
(env().global.fetch != null) {\n return env().global.fetch(path, requestInits);\n }\n\n if (systemFetch == null)
{\n systemFetch = getNodeFetch.importFetch();\n }\n return systemFetch(path, requestInits);\n }\n\n now():
number {\n const time = process.hrtime();\n return time[0] * 1000 + time[1] / 1000000;\n }\n\n encode(text:
string, encoding: string): Uint8Array {\n if (encoding !== 'utf-8' && encoding !== 'utf8') {\n throw new
Error(\n `Node built-in encoder only supports utf-8, but got ${encoding}`);\n }\n return
this.textEncoder.encode(text);\n }\n decode(bytes: Uint8Array, encoding: string): string {\n if (bytes.length ===
0) {\n return ";\n }\n return new this.util.TextDecoder(encoding).decode(bytes);\n }\n\nif
(env().get('IS_NODE')) {\n env().setPlatform('node', new PlatformNode());\n }\n\n"/**\n * @license\n * Copyright
2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {TensorBuffer} from './tensor';\nimport {DataType, DataTypeMap, Rank, ShapeMap} from
'./types';\nimport * as util from './util';\n\n/**\n * Creates an empty `tf.TensorBuffer` with the specified `shape` and
`dtype`.\n *\n * The values are stored in CPU as `TypedArray`. Fill the buffer using\n * `buffer.set()`, or by
modifying directly `buffer.values`.\n *\n * When done, call `buffer.toTensor()` to get an immutable `tf.Tensor`
with\n * those values.\n *\n * ``js\n * // Create a buffer and set values at particular indices.\n * const buffer =
tf.buffer([2, 2]);\n * buffer.set(3, 0, 0);\n * buffer.set(5, 1, 0);\n *\n * // Convert the buffer back to a tensor.\n *
buffer.toTensor().print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n *
@param dtype The dtype of the buffer. Defaults to 'float32'.\n * @param values The values of the buffer as
`TypedArray`. Defaults to\n * zeros.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\n\nexport
function buffer<R extends Rank, D extends DataType = 'float32'>(\n shape: ShapeMap[R], dtype: D = 'float32' as
D,\n values?: DataTypeMap[D]): TensorBuffer<R, D> {\n dtype = dtype || 'float32' as D;\n
util.assertNonNegativeIntegerDimensions(shape);\n return new TensorBuffer<R, D>(shape, dtype,
values);\n }\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Cast, CastAttrs, CastInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
'./tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {DataType, TensorLike} from

```





```

./ops/clone';\nimport { print } from './ops/print';\nimport { OpHandler, setOpHandler } from './tensor';\nconst
opHandler: OpHandler = {\n buffer,\n cast,\n clone,\n print\n};\nsetOpHandler(opHandler);\n"/**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\n**\n * IOHandlers related to files, such as browser-triggered file downloads,\n * user-selected files in
browser.\n *\nimport './flags';\nimport { env } from './environment';\nimport { basename,
concatenateArrayBuffers, getModelArtifactsInfoForJSON } from './io_utils';\nimport { IORouter, IORouterRegistry }
from './router_registry';\nimport { IOHandler, ModelArtifacts, ModelJSON, SaveResult, WeightsManifestConfig,
WeightsManifestEntry } from './types';\n\nconst DEFAULT_FILE_NAME_PREFIX = 'model';\nconst
DEFAULT_JSON_EXTENSION_NAME = '.json';\nconst DEFAULT_WEIGHT_DATA_EXTENSION_NAME =
'.weights.bin';\n\nfunction defer<T>(f: () => T): Promise<T> {\n return new Promise(resolve =>
setTimeout(resolve).then(f));\n}\n\nexport class BrowserDownloads implements IOHandler {\n private readonly
modelTopologyFileName: string;\n private readonly weightDataFileName: string;\n private readonly jsonAnchor:
HTMLAnchorElement;\n private readonly weightDataAnchor: HTMLAnchorElement;\n\n static readonly
URL_SCHEME = 'downloads://';\n\n constructor(fileNamePrefix?: string) {\n if
(!env().getBool('IS_BROWSER')) {\n // TODO(cais): Provide info on what IOHandlers are available under the\n
// current environment.\n throw new Error(\n 'browserDownloads() cannot proceed because the current
environment ' +\n 'is not a browser.);\n }\n if
(fileNamePrefix.startsWith(BrowserDownloads.URL_SCHEME)) {\n fileNamePrefix =
fileNamePrefix.slice(BrowserDownloads.URL_SCHEME.length);\n }\n if (fileNamePrefix == null ||
fileNamePrefix.length === 0) {\n fileNamePrefix = DEFAULT_FILE_NAME_PREFIX;\n }\n\n this.modelTopologyFileName = fileNamePrefix + DEFAULT_JSON_EXTENSION_NAME;\n
this.weightDataFileName =\n fileNamePrefix + DEFAULT_WEIGHT_DATA_EXTENSION_NAME;\n }\n\n async save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n if (typeof (document) === 'undefined') {\n
throw new Error(\n 'Browser downloads are not supported in ' +\n 'this environment since `document`
is not present');\n }\n const weightsURL = window.URL.createObjectURL(new Blob(\n
[modelArtifacts.weightData], { type: 'application/octet-stream'}));\n\n if (modelArtifacts.modelTopology
instanceof ArrayBuffer) {\n throw new Error(\n 'BrowserDownloads.save() does not support saving model
topology ' +\n 'in binary formats yet.);\n } else {\n const weightsManifest: WeightsManifestConfig = [{\n
paths: ['./' + this.weightDataFileName],\n weights: modelArtifacts.weightSpecs\n }];\n const
modelTopologyAndWeightManifest: ModelJSON = {\n modelTopology: modelArtifacts.modelTopology,\n
format: modelArtifacts.format,\n generatedBy: modelArtifacts.generatedBy,\n convertedBy:
modelArtifacts.convertedBy,\n weightsManifest\n }; \n if (modelArtifacts.signature != null) {\n
modelTopologyAndWeightManifest.signature = modelArtifacts.signature;\n }\n if
(modelArtifacts.userDefinedMetadata != null) {\n modelTopologyAndWeightManifest.userDefinedMetadata
=\n modelArtifacts.userDefinedMetadata;\n }\n if (modelArtifacts.modelInitializer != null) {\n
modelTopologyAndWeightManifest.modelInitializer =\n modelArtifacts.modelInitializer;\n }\n const
modelTopologyAndWeightManifestURL =\n window.URL.createObjectURL(new Blob(\n
[JSON.stringify(modelTopologyAndWeightManifest)],\n { type: 'application/json'}));\n\n // If anchor
elements are not provided, create them without attaching them\n // to parents, so that the downloaded file names
can be controlled.\n const jsonAnchor = this.jsonAnchor == null ? document.createElement('a') :\n
this.jsonAnchor;\n jsonAnchor.download = this.modelTopologyFileName;\n jsonAnchor.href
= modelTopologyAndWeightManifestURL;\n // Trigger downloads by evoking a click event on the download

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anchors.\n // When multiple downloads are started synchronously, Firefox will only\n // save the last one.\n
await defer(() => jsonAnchor.dispatchEvent(new MouseEvent('click')));\n if (modelArtifacts.weightData !=
null) {\n const weightDataAnchor = this.weightDataAnchor == null ?\n document.createElement('a') :\n this.weightDataAnchor;\n weightDataAnchor.download = this.weightDataFileName;\n
weightDataAnchor.href = weightsURL;\n await defer(\n () => weightDataAnchor.dispatchEvent(new
MouseEvent('click')));\n }\n return {modelArtifactsInfo:
getModelArtifactsInfoForJSON(modelArtifacts)};\n }\n }\n\n\nclass BrowserFiles implements IOHandler {\n
private readonly files: File[];\n\n constructor(files: File[]) {\n if (files == null || files.length < 1) {\n throw new
Error(\n `When calling browserFiles, at least 1 file is required, ` +\n `but received ${files}`);\n }\n
this.files = files;\n }\n\n async load(): Promise<ModelArtifacts> {\n const jsonFile = this.files[0];\n const
weightFiles = this.files.slice(1);\n\n return new Promise<ModelArtifacts>((resolve, reject) => {\n const
jsonReader = new FileReader();\n jsonReader.onload = (event: Event) => {\n // tslint:disable-next-line:no-
any\n const modelJSON = JSON.parse((event.target as any).result) as ModelJSON;\n const modelTopology
= modelJSON.modelTopology;\n if (modelTopology == null) {\n reject(new Error(\n
`modelTopology field is missing from file ${jsonFile.name}`));\n return;\n }\n\n if
(weightFiles.length === 0) {\n resolve({modelTopology});\n }\n\n const weightsManifest =
modelJSON.weightsManifest;\n if (weightsManifest == null) {\n reject(new Error(\n
`weightManifest field is missing from file ${jsonFile.name}`));\n return;\n }\n\n let pathToFile:
{[path: string]: File};\n try {\n pathToFile =\n
this.checkManifestAndWeightFiles(weightsManifest, weightFiles);\n } catch (err) {\n reject(err);\n
return;\n }\n\n const weightSpecs: WeightsManifestEntry[] = [];\n const paths: string[] = [];\n
const perFileBuffers: ArrayBuffer[] = [];\n weightsManifest.forEach(weightsGroup => {\n
weightsGroup.paths.forEach(path => {\n paths.push(path);\n perFileBuffers.push(null);\n });\n
weightSpecs.push(...weightsGroup.weights);\n });\n weightsManifest.forEach(weightsGroup => {\n
weightsGroup.paths.forEach(path => {\n const weightFileReader = new FileReader();\n
weightFileReader.onload = (event: Event) => {\n // tslint:disable-next-line:no-any\n const
weightData = (event.target as any).result as ArrayBuffer;\n const index = paths.indexOf(path);\n
perFileBuffers[index] = weightData;\n if (perFileBuffers.indexOf(null) === -1) {\n const result:
ModelArtifacts = {\n modelTopology,\n weightSpecs,\n weightData:\n
concatenateArrayBuffers(perFileBuffers),\n format: modelJSON.format,\n generatedBy:\n
modelJSON.generatedBy,\n convertedBy: modelJSON.convertedBy\n }; \n if
(modelJSON.signature != null) {\n result.signature = modelJSON.signature;\n } \n if
(modelJSON.userDefinedMetadata != null) {\n result.userDefinedMetadata =
modelJSON.userDefinedMetadata;\n } \n if (modelJSON.modelInitializer != null) {\n
result.modelInitializer = modelJSON.modelInitializer;\n } \n resolve(result);\n } \n
});\n weightFileReader.onerror = error =>\n reject(`Failed to weights data from file of path
'${path}'.`);\n weightFileReader.readAsArrayBuffer(pathToFile[path]);\n });\n });\n });\n
jsonReader.onerror = error => reject(\n `Failed to read model topology and weights manifest JSON ` +\n
`from file '${jsonFile.name}'. BrowserFiles supports loading ` +\n `Keras-style tf.Model artifacts only.`);\n
jsonReader.readAsText(jsonFile);\n });\n }\n\n /**\n * Check the compatibility between weights manifest and
weight files.\n *\n private checkManifestAndWeightFiles(\n manifest: WeightsManifestConfig, files: File[]):
{[path: string]: File} {\n const basenames: string[] = [];\n const fileNames = files.map(file =>
basename(file.name));\n const pathToFile: {[path: string]: File} = {};\n for (const group of manifest) {\n
group.paths.forEach(path => {\n const pathBasename = basename(path);\n if
(basenames.indexOf(pathBasename) !== -1) {\n throw new Error(\n `Duplicate file basename found in
weights manifest: ` +\n ` '${pathBasename}'`);\n } \n basenames.push(pathBasename);\n if
(fileNames.indexOf(pathBasename) === -1) {\n throw new Error(\n `Weight file with basename
'${pathBasename}' is not provided.`);\n } else {\n pathToFile[path] =

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files[fileNames.indexOf(pathBasename)];\n }\n });\n }\n\n if (basenames.length !== files.length) {\n throw new Error(\n `Mismatch in the number of files in weights manifest ` +\n `(${basenames.length})\n and the number of weight files provided ` +\n `(${files.length}).`);\n }\n return pathToFile;\n}\n}\n\nexport const browserDownloadsRouter: IORouter = (url: string|string[]) => {\n if\n (!env().getBool('IS_BROWSER')) {\n return null;\n } else {\n if (!Array.isArray(url) &&\n url.startsWith(BrowserDownloads.URL_SCHEME)) {\n return\n browserDownloads(url.slice(BrowserDownloads.URL_SCHEME.length));\n } else {\n return null;\n }\n }\n}\n\nIORouterRegistry.registerSaveRouter(browserDownloadsRouter);\n\n/**\n * Creates an IOHandler that\n * triggers file downloads from the browser.\n *\n * The returned `IOHandler` instance can be used as model exporting\n * methods such\n * as `tf.Model.save` and supports only saving.\n *\n * ```js\n * const model = tf.sequential();\n * model.add(tf.layers.dense({units: 1, inputShape: [10], activation: 'sigmoid'}));\n * const saveResult = await\n * model.save('downloads://mymodel');\n * // This will trigger downloading of two files:\n * // 'mymodel.json' and\n * 'mymodel.weights.bin'.\n * console.log(saveResult);\n * ```\n *\n * @param fileNamePrefix Prefix name of the files\n * to be downloaded. For use with\n * `tf.Model`, `fileNamePrefix` should follow either of the following two\n * formats:\n * 1. `null` or `undefined`, in which case the default file\n * names will be used:\n * - 'model.json'\n * for the JSON file containing the model topology and\n * weights.manifest.\n * - 'model.weights.bin' for the\n * binary file containing the binary weight\n * values.\n * 2. A single string or an Array of a single string, as the\n * file name prefix.\n * For example, if `foo` is provided, the downloaded JSON\n * file and binary weights file\n * will be named 'foo.json' and\n * 'foo.weights.bin', respectively.\n *\n * @param config Additional configuration for\n * triggering downloads.\n * @returns An instance of `BrowserDownloads` `IOHandler`.\n *\n * @doc {\n * heading:\n * 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n\nexport function\n browserDownloads(fileNamePrefix = 'model'): IOHandler {\n return new\n BrowserDownloads(fileNamePrefix);\n}\n\n/**\n * Creates an IOHandler that loads model artifacts from user-\n * selected files.\n *\n * This method can be used for loading from files such as user-selected files\n * in the browser.\n *\n * When used in conjunction with `tf.loadLayersModel`, an instance of\n * `tf.LayersModel` (Keras-style) can be\n * constructed from the loaded artifacts.\n *\n * ```js\n * // Note: This code snippet won't run properly without the\n * actual file input\n * // elements in the HTML DOM.\n * // Suppose there are two HTML file input (<input\n * type="file" ...>)\n * // elements.\n * const uploadJSONInput = document.getElementById('upload-json');\n * const\n * uploadWeightsInput = document.getElementById('upload-weights');\n * const model = await\n * tf.loadLayersModel(tf.io.browserFiles([\n * uploadJSONInput.files[0], uploadWeightsInput.files[0]]));\n * ```\n *\n * @param files `File`s to load from. Currently, this function supports only\n * loading from files that contain\n * Keras-style models (i.e., `tf.Model`s), for\n * which an `Array` of `File`s is expected (in that order):\n * - A JSON\n * file containing the model topology and weight manifest.\n * - Optionally, One or more binary files containing the\n * binary weights.\n * These files must have names that match the paths in the `weightsManifest`\n * contained by\n * the aforementioned JSON file, or errors will be thrown\n * during loading. These weights files have the same\n * format as the ones\n * generated by `tensorflowjs_converter` that comes with the `tensorflowjs`\n * Python PIP\n * package. If no weights files are provided, only the model\n * topology will be loaded from the JSON file above.\n *\n * @returns An instance of `Files` `IOHandler`.\n *\n * @doc {\n * heading: 'Models',\n * subheading:\n * 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n\nexport function browserFiles(files: File[]): IOHandler\n {\n return new BrowserFiles(files);\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n * =====\n *\n */\nimport {assert} from './util';\nimport {OnProgressCallback} from './types';\n\n/**\n * Monitor Promise.all

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progress, fire onProgress callback function.\n * @param promises Promise list going to be monitored\n *
@param onProgress Callback function. Fired when a promise resolved.\n * @param startFraction Optional fraction
start. Default to 0.\n * @param endFraction Optional fraction end. Default to 1.\n */\nexport function
monitorPromisesProgress(\n promises: Array<Promise<{}|void>>, onProgress: OnProgressCallback,\n startFraction?: number, endFraction?: number) {\n checkPromises(promises);\n startFraction = startFraction ==
null ? 0 : startFraction;\n endFraction = endFraction == null ? 1 : endFraction;\n checkFraction(startFraction,
endFraction);\n let resolvedPromise = 0;\n\n const registerMonitor = (promise: Promise<{}>) => {\n
promise.then(value => {\n const fraction = startFraction +\n ++resolvedPromise / promises.length *
(endFraction - startFraction);\n // pass fraction as parameter to callback function.\n onProgress(fraction);\n
return value;\n });\n return promise;\n };}\n\n function checkPromises(promises: Array<Promise<{}|void>>):
void {\n assert(\n promises != null && Array.isArray(promises) && promises.length > 0,\n () =>
'promises must be a none empty array');\n }\n\n function checkFraction(startFraction: number, endFraction:
number): void {\n assert(\n startFraction >= 0 && startFraction <= 1,\n () => `Progress fraction must be
in range [0, 1], but ` +\n `got startFraction ${startFraction}`);\n assert(\n endFraction >= 0 &&
endFraction <= 1,\n () => `Progress fraction must be in range [0, 1], but ` +\n `got endFraction
${endFraction}`);\n assert(\n endFraction >= startFraction,\n () => `startFraction must be no more than
endFraction, but ` +\n `got startFraction ${startFraction} and endFraction ` +\n ` ${endFraction}`);\n
}\n\n return Promise.all(promises.map(registerMonitor));\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {env} from './environment';\n\nimport {NamedTensorMap} from './tensor_types';\n\nimport * as util
from './util';\n\nimport {decodeWeights} from './io_utils';\n\nimport {monitorPromisesProgress} from
'./progress';\n\nimport {DTYPE_VALUE_SIZE_MAP, LoadOptions, WeightsManifestConfig,
WeightsManifestEntry} from './types';\n\n/**\n * Reads binary weights data from a number of URLs.\n *
@param fetchURLs URLs to send the HTTP requests at, using `fetch` calls.\n * @param requestOptions
RequestInit (options) for the HTTP requests.\n * @param fetchFunc Optional overriding value for the
`window.fetch` function.\n * @param onProgress Optional, progress callback function, fired periodically\n *
before the load is completed.\n * @returns A `Promise` of an Array of `ArrayBuffer`. The Array has the same\n *
length as `fetchURLs`.\n */\nexport async function loadWeightsAsArrayBuffer(\n fetchURLs: string[],
loadOptions?: LoadOptions): Promise<ArrayBuffer[]> {\n if (loadOptions == null) {\n loadOptions = {};\n }\n\n const fetchFunc = loadOptions.fetchFunc == null ? env().platform.fetch :\n loadOptions.fetchFunc;\n\n // Create the requests for all of the weights in parallel.\n const requests =
fetchURLs.map(\n fetchURL =>\n fetchFunc(fetchURL, loadOptions.requestInit, {isBinary: true});\n);\n\n const fetchStartFraction = 0;\n const fetchEndFraction = 0.5;\n\n const responses = loadOptions.onProgress == null
?\n await Promise.all(requests) :\n await monitorPromisesProgress(\n requests, loadOptions.onProgress,
fetchStartFraction,\n fetchEndFraction);\n\n const bufferPromises = responses.map(response =>
response.arrayBuffer());\n\n const bufferStartFraction = 0.5;\n const bufferEndFraction = 1;\n\n const buffers =
loadOptions.onProgress == null ?\n await Promise.all(bufferPromises) :\n await monitorPromisesProgress(\n
 bufferPromises, loadOptions.onProgress, bufferStartFraction,\n bufferEndFraction);\n\n return
buffers;\n}\n\n/**\n * Reads a weights manifest JSON configuration, fetches the weights and\n * returns them as
`Tensor`s.\n * @param manifest The weights manifest JSON.\n * @param filePathPrefix The path prefix for
filenames given in the manifest.\n * Defaults to the empty string.\n * @param weightNames The names of the
weights to be fetched.\n */\nexport async function loadWeights(\n manifest: WeightsManifestConfig,

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filePathPrefix = "\n weightNames?: string[],\n requestInit?: RequestInit): Promise<NamedTensorMap> {\n //
TODO(nsthorat): Groups are currently fetched atomically. If you need a\n // single weight from a group, the whole
group will be fetched. At a future\n // date, we should support fetching only the individual shards within a\n //
group that are needed to reconstruct the requested weight.\n // TODO(cais): Use `decodeWeights` for
implementation.\n\n const fetchWeights = (fetchUrls: string[]) =>\n loadWeightsFromArrayBuffer(fetchUrls,
{requestInit});\n const loadWeights = weightsLoaderFactory(fetchWeights);\n\n return loadWeights(manifest,
filePathPrefix, weightNames);\n}\n\n/**\n * Creates a function, which reads a weights manifest JSON
configuration,\n * fetches the weight files using the specified function and returns them as\n * `Tensor`s.\n *
```\n * // example for creating a nodejs weight loader, which reads the weight files\n * // from disk using
fs.readFileSync\n * \n * import * as fs from 'fs'\n * \n * const fetchWeightsFromDisk = (filePaths: string[]) =>\n *
filePaths.map(filePath => fs.readFileSync(filePath).buffer)\n * \n * const loadWeights =
tf.io.weightsLoaderFactory(fetchWeightsFromDisk)\n * \n * const manifest = JSON.parse(\n *
fs.readFileSync('./my_model-weights_manifest').toString()\n * )\n * \n * const weightMap = await
loadWeights(manifest, './')\n * ```\n * @param fetchWeightsFunction The function used for fetching the weight
files.\n * @returns Weight loading function.\n */\nexport function weightsLoaderFactory(\n
fetchWeightsFunction: (fetchUrls: string[]) => Promise<ArrayBuffer[]>):\n (manifest: WeightsManifestConfig,
filePathPrefix?: string,\n  weightNames?: string[]) => Promise<NamedTensorMap> {\n  return async(\n
manifest: WeightsManifestConfig, filePathPrefix = "\n    weightNames?: string[]):\n
Promise<NamedTensorMap> => {\n  // Collect all the groups, weights, and their relative offsets to be\n  //
fetched.\n  const groupIndicesToFetchMap = manifest.map(() => false);\n  const groupWeightsToFetch: {\n
[group: number]: Array<{\n    manifestEntry: WeightsManifestEntry; groupOffset: number;\n    sizeBytes:
number;\n  }>\n  } = {};\n  const weightsFound =\n    weightNames != null ? weightNames.map(() => false)
: [];\n  const allManifestWeightNames: string[] = [];\n  manifest.forEach((manifestGroupConfig, groupIndex) =>
{\n    let groupOffset = 0;\n    manifestGroupConfig.weights.forEach(weightsEntry => {\n      const rawDtype =
('quantization' in weightsEntry) ?\n        weightsEntry.quantization.dtype :\n        weightsEntry.dtype;\n\n
const weightsBytes = DTYPE_VALUE_SIZE_MAP[rawDtype] *\n
util.sizeFromShape(weightsEntry.shape);\n\n      const enqueueWeightsForFetchingFn = () => {\n
groupIndicesToFetchMap[groupIndex] = true;\n        if (groupWeightsToFetch[groupIndex] == null) {\n
groupWeightsToFetch[groupIndex] = [];\n          }\n          groupWeightsToFetch[groupIndex].push({\n
manifestEntry: weightsEntry,\n            groupOffset,\n            sizeBytes: weightsBytes\n          });\n        };\n\n
if (weightNames != null) {\n          weightNames.forEach((weightName, weightIndex) => {\n            if (weightName
=== weightsEntry.name) {\n              enqueueWeightsForFetchingFn();\n              weightsFound[weightIndex] =
true;\n            }\n          });\n        } else {\n          enqueueWeightsForFetchingFn();\n        }\n\n
allManifestWeightNames.push(weightsEntry.name);\n        groupOffset += weightsBytes;\n      });\n    });\n\n
if (!weightsFound.every(found => found)) {\n      const weightsNotFound = weightNames.filter((_, i) =>
!weightsFound[i]);\n      throw new Error(\n        `Could not find weights in manifest with names: ` +\n
`${weightsNotFound.join(', ')}`.\n        +\n        `Manifest JSON has weights with names: ` +\n
`${allManifestWeightNames.join(', ')}`.\n      );\n    }\n\n    // Convert the one-hot boolean groupId => shouldFetch map to
a list of group\n    // IDs.\n    const groupIndicesToFetch =\n      groupIndicesToFetchMap.reduce((accumulator,
shouldFetch, i) => {\n      if (shouldFetch) {\n        accumulator.push(i);\n      }\n      return accumulator;\n
}, []);\n\n    const fetchUrls: string[] = [];\n    groupIndicesToFetch.forEach(i => {\n      manifest[i].paths.forEach(filePath => {\n
const fetchUrl = filePathPrefix +\n
(!filePathPrefix.endsWith('/') ? '/' : '') + filePath;\n        fetchUrls.push(fetchUrl);\n      });\n    });\n
const buffers =
await fetchWeightsFunction(fetchUrls);\n\n    const weightsTensorMap: NamedTensorMap = {};\n    let
bufferIndexOffset = 0;\n    groupIndicesToFetch.forEach(i => {\n      const numBuffers =
manifest[i].paths.length;\n      let groupBytes = 0;\n      for (let i = 0; i < numBuffers; i++) {\n        groupBytes +=
buffers[bufferIndexOffset + i].byteLength;\n      }\n\n      // Create a buffer for the whole group.\n      const
groupBuffer = new ArrayBuffer(groupBytes);\n      const groupByteBuffer = new Uint8Array(groupBuffer);\n      let

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groupBufferOffset = 0;\n    for (let i = 0; i < numBuffers; i++) {\n        const buffer = new
Uint8Array(buffers[bufferIndexOffset + i]);\n        groupByteBuffer.set(buffer, groupBufferOffset);\n
groupBufferOffset += buffer.byteLength;\n    }\n\n    const weightsEntries = groupWeightsToFetch[i];\n
weightsEntries.forEach(weightsEntry => {\n        const byteBuffer = groupBuffer.slice(\n
weightsEntry.groupOffset,\n            weightsEntry.groupOffset + weightsEntry.sizeBytes);\n        const
nameToTensorMap =\n            decodeWeights(byteBuffer, [weightsEntry.manifestEntry]);\n        for (const name in
nameToTensorMap) {\n            weightsTensorMap[name] = nameToTensorMap[name];\n        }\n    });\n\n
bufferIndexOffset += numBuffers;\n });\n\n return weightsTensorMap;\n };}\n\n", "/*\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\n**\n * IOHandler implementations based on HTTP requests in the web browser.\n *\n * Uses
[ fetch`](https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n *\n\nimport { env } from
'./environment';\n\nimport { assert } from './util';\n\nimport { concatenateArrayBuffers,
getModelArtifactsInfoForJSON } from './io_utils';\n\nimport { IORouter, IORouterRegistry } from
'./router_registry';\n\nimport { IOHandler, LoadOptions, ModelArtifacts, ModelJSON, OnProgressCallback,
SaveResult, WeightsManifestConfig, WeightsManifestEntry } from './types';\n\nimport { loadWeightsAsArrayBuffer }
from './weights_loader';\n\nconst OCTET_STREAM_MIME_TYPE = 'application/octet-stream';\nconst
JSON_TYPE = 'application/json';\n\nexport class HTTPRequest implements IOHandler {\n    protected readonly path:
string;\n    protected readonly requestInit: RequestInit;\n\n    private readonly fetch: Function;\n    private readonly
weightUrlConverter: (weightName: string) => Promise<string>;\n\n    readonly DEFAULT_METHOD = 'POST';\n\n    static
readonly URL_SCHEME_REGEX = /^https?:\\/\\/;/\n\n    private readonly weightPathPrefix: string;\n    private
readonly onProgress: OnProgressCallback;\n\n    constructor(path: string, loadOptions?: LoadOptions) {\n        if
(loadOptions == null) {\n            loadOptions = {};\n        }\n        this.weightPathPrefix = loadOptions.weightPathPrefix;\n
this.onProgress = loadOptions.onProgress;\n        this.weightUrlConverter = loadOptions.weightUrlConverter;\n\n        if
(loadOptions.fetchFunc != null) {\n            assert(\n                typeof loadOptions.fetchFunc === 'function',\n                () =>
'Must pass a function that matches the signature of ' +\n                    `fetch` (see ' +\n
'https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API));\n            this.fetch = loadOptions.fetchFunc;\n        }
else {\n            this.fetch = env().platform.fetch;\n        }\n\n        assert(\n            path != null && path.length > 0,\n            () =>
'URL path for http must not be null, undefined or ' +\n                'empty.');

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    modelArtifacts.userDefinedMetadata;\n  }\n  if (modelArtifacts.modelInitializer != null) {\n
modelTopologyAndWeightManifest.modelInitializer =\n    modelArtifacts.modelInitializer;\n  }\n\n
init.body.append(\n    'model.json',\n    new Blob(\n
[JSON.stringify(modelTopologyAndWeightManifest)],\n    {type: JSON_TYPE}),\n    'model.json');\n\n
if (modelArtifacts.weightData != null) {\n  init.body.append(\n    'model.weights.bin',\n    new
Blob([modelArtifacts.weightData], {type: OCTET_STREAM_MIME_TYPE}),\n    'model.weights.bin');\n
}\n\n
const response = await this.fetch(this.path, init);\n\n
if (response.ok) {\n  return {\n
modelArtifactsInfo: getModelArtifactsInfoForJSON(modelArtifacts),\n    responses: [response],\n  }; \n
} else {\n  throw new Error(\n    `BrowserHTTPRequest.save() failed due to HTTP response status ` +\n
`${response.status}.`);\n  }\n}\n\n
/**\n * Load model artifacts via HTTP request(s).\n *\n * See the
documentation to `tf.io.http` for details on the saved\n * artifacts.\n *\n * @returns The loaded model artifacts (if
loading succeeds).\n *\n async load(): Promise<ModelArtifacts> {\n  const modelConfigRequest = await
this.fetch(this.path, this.requestInit);\n\n
if (!modelConfigRequest.ok) {\n  throw new Error(\n    `Request to
${this.path} failed with status code ` +\n    `${modelConfigRequest.status}. Please verify this URL points to `
+\n    `the model JSON of the model to load.`);\n  }\n  let modelConfig: ModelJSON;\n  try {\n
modelConfig = await modelConfigRequest.json();\n  } catch (e) {\n  let message = `Failed to parse model JSON
of response from ${this.path}.`; \n  // TODO(nsthorat): Remove this after some time when we're comfortable
that\n  // .pb files are mostly gone.\n  if (this.path.endsWith('.pb')) {\n  message += ' Your path contains a
.pb file extension. ' +\n    'Support for .pb models have been removed in TensorFlow.js 1.0 ' +\n    'in favor
of .json models. You can re-convert your Python ' +\n    'TensorFlow model using the TensorFlow.js 1.0
conversion scripts ' +\n    'or you can convert your.pb models with the `pb2json` ' +\n    'NPM script in
the tensorflow/tfjs-converter repository.';\n  } else {\n  message += ' Please make sure the server is serving
valid ' +\n    'JSON for this request.';\n  }\n  throw new Error(message);\n  }\n  const modelTopology =
modelConfig.modelTopology;\n  const weightsManifest = modelConfig.weightsManifest;\n  const generatedBy =
modelConfig.generatedBy;\n  const convertedBy = modelConfig.convertedBy;\n  const format =
modelConfig.format;\n  const signature = modelConfig.signature;\n  const userDefinedMetadata =
modelConfig.userDefinedMetadata;\n\n
// We do not allow both modelTopology and weightsManifest to be
missing.\n  if (modelTopology == null && weightsManifest == null) {\n  throw new Error(\n    `The JSON
from HTTP path ${this.path} contains neither model ` +\n    `topology or manifest for weights.`);\n  }\n\n
let weightSpecs: WeightsManifestEntry[];\n  let weightData: ArrayBuffer;\n  if (weightsManifest != null) {\n
const results = await this.loadWeights(weightsManifest);\n  [weightSpecs, weightData] = results;\n  }\n\n
const artifacts: ModelArtifacts = {\n  modelTopology,\n  weightSpecs,\n  weightData,\n  generatedBy,\n
convertedBy,\n  format\n  };\n\n
if (signature != null) {\n  artifacts.signature = signature;\n  }\n  if
(userDefinedMetadata != null) {\n  artifacts.userDefinedMetadata = userDefinedMetadata;\n  }\n\n
const initializer = modelConfig.modelInitializer;\n  if (initializer) {\n  artifacts.modelInitializer = initializer;\n
}\n\n
return artifacts;\n  }\n\n
private async loadWeights(weightsManifest: WeightsManifestConfig): \n
Promise<[WeightsManifestEntry[], ArrayBuffer]> {\n  const weightPath = Array.isArray(this.path) ? this.path[1] :
this.path;\n  const [prefix, suffix] = parseUrl(weightPath);\n  const pathPrefix = this.weightPathPrefix ||
prefix;\n\n
const weightSpecs = [];\n  for (const entry of weightsManifest) {\n
weightSpecs.push(...entry.weights);\n  }\n\n
const fetchURLs: string[] = [];\n  const urlPromises:
Array<Promise<string>> = [];\n  for (const weightsGroup of weightsManifest) {\n  for (const path of
weightsGroup.paths) {\n  if (this.weightUrlConverter != null) {\n
urlPromises.push(this.weightUrlConverter(path));\n  } else {\n  fetchURLs.push(pathPrefix + path +
suffix);\n  }\n  }\n  }\n\n
if (this.weightUrlConverter) {\n  fetchURLs.push(...await
Promise.all(urlPromises));\n  }\n\n
const buffers = await loadWeightsAsArrayBuffer(fetchURLs, {\n
requestInit: this.requestInit,\n  fetchFunc: this.fetch,\n  onProgress: this.onProgress\n  });\n  return
[weightSpecs, concatenateArrayBuffers(buffers)];\n  }\n}\n\n
/**\n * Extract the prefix and suffix of the url, where
the prefix is the path before\n * the last file, and suffix is the search params after the last file.\n *\n
const url =

```

```

'http://tfhub.dev/model/1/tensorflowjs_model.pb?tfjs-format=file'\n * [prefix, suffix] = parseUrl(url)\n * // prefix =
'http://tfhub.dev/model/1/'\n * // suffix = '?tfjs-format=file'\n * ``\n * @param url the model url to be parsed.\n
*\nexport function parseUrl(url: string): [string, string] {\n  const lastSlash = url.lastIndexOf('/');\n  const
lastSearchParam = url.lastIndexOf('?');\n  const prefix = url.substring(0, lastSlash);\n  const suffix =\n
lastSearchParam > lastSlash ? url.substring(lastSearchParam) : '';\n  return [prefix + '/', suffix];\n}\n\nexport function
isHTTPScheme(url: string): boolean {\n  return url.match(HTTPRequest.URL_SCHEME_REGEX) !=
null;\n}\n\nexport const httpRouter: IORouter =\n  (url: string, loadOptions?: LoadOptions) => {\n    if (typeof
fetch === 'undefined' &&\n      (loadOptions == null || loadOptions.fetchFunc == null)) {\n      // `http` uses
`fetch` or `node-fetch`, if one wants to use it in\n      // an environment that is not the browser or node they have to
setup a\n      // global fetch polyfill.\n      return null;\n    } else {\n      let isHTTP = true;\n      if
(Array.isArray(url)) {\n        isHTTP = url.every(urlItem => isHTTPScheme(urlItem));\n      } else {\n
isHTTP = isHTTPScheme(url);\n      }\n      if (isHTTP) {\n        return http(url, loadOptions);\n      }\n    }\n  }\n
return null;\n
};\nIORouterRegistry.registerSaveRouter(httpRouter);\nIORouterRegistry.registerLoadRouter(httpRouter);\n\n/**\n
* Creates an IOHandler subtype that sends model artifacts to HTTP server.\n * An HTTP request of the
`multipart/form-data` mime type will be sent to the\n * `path` URL. The form data includes artifacts that represent
the topology\n * and/or weights of the model. In the case of Keras-style `tf.Model`, two\n * blobs (files) exist in
form-data:\n * - A JSON file consisting of `modelTopology` and `weightsManifest`.\n * - A binary weights file
consisting of the concatenated weight values.\n * These files are in the same format as the one generated by\n *
[tfjs_converter](https://js.tensorflow.org/tutorials/import-keras.html).\n *\n * The following code snippet
exemplifies the client-side code that uses this\n * function:\n * ```\n * const model = tf.sequential();\n *
model.add(\n *   tf.layers.dense({units: 1, inputShape: [100], activation: 'sigmoid'}));\n * const saveResult =
await model.save(tf.io.http(\n *   'http://model-server:5000/upload', {requestInit: {method: 'PUT'}}));\n *
console.log(saveResult);\n * ```\n *\n * If the default `POST` method is to be used, without any custom parameters\n
* such as headers, you can simply pass an HTTP or HTTPS URL to `model.save`:\n * ```\n * const saveResult
= await model.save('http://model-server:5000/upload');\n * ```\n *\n * The following GitHub Gist\n *
https://gist.github.com/dsmilkov/1b6046fd6132d7408d5257b0976f7864\n * implements a server based on
[flask](https://github.com/pallets/flask) that\n * can receive the request. Upon receiving the model artifacts via the
request,\n * this particular server reconstitutes instances of [Keras\n * Models](https://keras.io/models/model/) in
memory.\n * \n * @param path A URL path to the model.\n * Can be an absolute HTTP path (e.g.,\n *
'http://localhost:8000/model-upload') or a relative path (e.g.,\n * './model-upload').\n * @param requestInit
Request configurations to be used when sending\n * HTTP request to server using `fetch`. It can contain fields
such as\n * `method`, `credentials`, `headers`, `mode`, etc. See\n * https://developer.mozilla.org/en-
US/docs/Web/API/Request/Request\n * for more information. `requestInit` must not have a body, because the\n *
body will be set by TensorFlow.js. File blobs representing the model\n * topology (filename: 'model.json') and the
weights of the model (filename:\n * 'model.weights.bin') will be appended to the body. If `requestInit` has a\n *
`body`, an Error will be thrown.\n * @param loadOptions Optional configuration for the loading. It includes the\n *
following fields:\n * - weightPathPrefix Optional, this specifies the path prefix for weight\n * files, by default
this is calculated from the path param.\n * - fetchFunc Optional, custom `fetch` function. E.g., in Node.js,\n * the
`fetch` from node-fetch can be used here.\n * - onProgress Optional, progress callback function, fired
periodically\n * before the load is completed.\n * @returns An instance of `IOHandler`.\n * @doc {\n *
heading: 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n *\nexport function
http(path: string, loadOptions?: LoadOptions): IOHandler {\n  return new HTTPRequest(path,
loadOptions);\n}\n\n/**\n * Deprecated. Use `tf.io.http`.\n * @param path\n * @param loadOptions\n *\nexport
function browserHTTPRequest(\n  path: string, loadOptions?: LoadOptions): IOHandler {\n  return http(path,
loadOptions);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *

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*/\n\n/**\n * IOHandlers that pass through the in-memory ModelArtifacts format.\n */\n\nimport {IOHandler,
ModelArtifacts, SaveResult, TrainingConfig, WeightsManifestEntry} from './types';\n\nclass PassthroughLoader implements IOHandler {\n  constructor(private readonly modelArtifacts?: ModelArtifacts) {}\n\n  async load(): Promise<ModelArtifacts> {\n    return this.modelArtifacts;\n  }\n}\n\nclass PassthroughSaver implements IOHandler {\n  constructor(\n    private readonly saveHandler:\n      (artifacts: ModelArtifacts) => Promise<SaveResult>)\n  ) {\n    async save(modelArtifacts: ModelArtifacts) {\n      return this.saveHandler(modelArtifacts);\n    }\n  }\n}\n\n/**\n * Creates an IOHandler that loads model artifacts from memory.\n *\n * When used in conjunction with `tf.loadLayersModel`, an instance of `tf.LayersModel` (Keras-style) can be constructed from the loaded artifacts.\n *\n * ```js\n * const model = await tf.loadLayersModel(tf.io.fromMemory(\n *   modelTopology, weightSpecs, weightData));\n * ```\n *\n * @param modelArtifacts a object containing model topology (i.e., parsed from the JSON format).\n * @param weightSpecs An array of `WeightsManifestEntry` objects describing the names, shapes, types, and quantization of the weight data.\n * @param weightData A single `ArrayBuffer` containing the weight data, concatenated in the order described by the weightSpecs.\n * @param trainingConfig Model training configuration. Optional.\n *\n * @returns A passthrough `IOHandler` that simply loads the provided data.\n */\nexport function fromMemory(\n  modelArtifacts: {} | ModelArtifacts, weightSpecs?: WeightsManifestEntry[],\n  weightData?: ArrayBuffer, trainingConfig?: TrainingConfig): IOHandler {\n  if (arguments.length === 1) {\n    const isModelArtifacts =\n      (modelArtifacts as ModelArtifacts).modelTopology != null ||\n      (modelArtifacts as ModelArtifacts).weightSpecs != null;\n    if (isModelArtifacts) {\n      return new PassthroughLoader(modelArtifacts as ModelArtifacts);\n    } else {\n      // Legacy support: with only modelTopology.\n      // TODO(cais): Remove this deprecated API.\n      console.warn(\n        'Please call tf.io.fromMemory() with only one argument. '\n        'The argument should be of type ModelArtifacts. '\n        'The multi-argument signature of tf.io.fromMemory() has been '\n        'deprecated and will be removed in a future release.);\n      return new PassthroughLoader({modelTopology:\n        modelArtifacts as {}});\n    }\n  } else {\n    // Legacy support.\n    // TODO(cais): Remove this deprecated API.\n    console.warn(\n      'Please call tf.io.fromMemory() with only one argument. '\n      'The argument should be of type ModelArtifacts. '\n      'The multi-argument signature of tf.io.fromMemory() has been '\n      'deprecated and will be removed in a future release.);\n    return new PassthroughLoader({\n      modelTopology: modelArtifacts as {},\n      weightSpecs,\n      weightData,\n      trainingConfig\n    });\n  }\n}\n\n/**\n * Creates an IOHandler that passes saved model artifacts to a callback.\n *\n * ```js\n * function handleSave(artifacts) {\n *   // ... do something with the artifacts ...\n *   return {modelArtifactsInfo: {...}, ...};\n * }\n *\n * const saveResult = model.save(tf.io.withSaveHandler(handleSave));\n * ```\n *\n * @param saveHandler A function that accepts a `ModelArtifacts` and returns a `SaveResult`.\n */\nexport function withSaveHandler(\n  saveHandler:\n    (artifacts: ModelArtifacts) => Promise<SaveResult>): IOHandler {\n  return new PassthroughSaver(saveHandler);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
```

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*/\n\n// Importing local_storage and indexed_db is necessary for the routers to be\n// registered.\nimport './indexed_db';\nimport './local_storage';\nimport {browserFiles} from './browser_files';\nimport
```

```
{browserHTTPRequest, http, isHTTPScheme} from './http';\nimport {concatenateArrayBuffers, decodeWeights, encodeWeights, getModelArtifactsInfoForJSON} from './io_utils';\nimport {fromMemory, withSaveHandler} from './passthrough';\nimport {getLoadHandlers, getSaveHandlers, registerLoadRouter, registerSaveRouter} from './router_registry';\nimport {IOHandler, LoadHandler, LoadOptions, ModelArtifacts, ModelArtifactsInfo, ModelJSON, ModelStoreManager, OnProgressCallback, RequestDetails, SaveConfig, SaveHandler, SaveResult, WeightGroup, WeightsManifestConfig, WeightsManifestEntry} from './types';\nimport {loadWeights, weightsLoaderFactory} from './weights_loader';\n\nexport {copyModel, listModels, moveModel, removeModel} from './model_management';\nexport {\n  browserFiles,\n  browserHTTPRequest,\n  concatenateArrayBuffers,\n  decodeWeights,\n  encodeWeights,\n  fromMemory,\n  getLoadHandlers,\n  getModelArtifactsInfoForJSON,\n  getSaveHandlers,\n  http,\n  IOHandler,\n  isHTTPScheme,\n  LoadHandler,\n  LoadOptions,\n  loadWeights,\n  ModelArtifacts,\n  ModelArtifactsInfo,\n  ModelJSON,\n  ModelStoreManager,\n  OnProgressCallback,\n  registerLoadRouter,\n  registerSaveRouter,\n  RequestDetails,\n  SaveConfig,\n  SaveHandler,\n  SaveResult,\n  WeightGroup,\n  weightsLoaderFactory,\n  WeightsManifestConfig,\n  WeightsManifestEntry,\n  withSaveHandler\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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\n
*/\nimport {ENGINE} from './engine';\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the dot product of two matrices, A * B. These must be matrices.\n *
const a = tf.tensor2d([1, 2], [1, 2]);\n const b = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * a.matMul(b).print(); // or\n tf.matMul(a, b)\n *
@param a First matrix in dot product operation.\n * @param b Second matrix in dot product operation.\n * @param transposeA If true, `a` is transposed before multiplication.\n * @param transposeB If true, `b` is transposed before multiplication.\n *
@doc {heading: 'Operations', subheading: 'Matrices'}\n
*/\nfunction matMul<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike, transposeA = false,\n  transposeB = false): T {\n  let $a = convertToTensor(a, 'a', 'matMul');\n  let $b = convertToTensor(b, 'b', 'matMul');\n  [$a, $b] = makeTypesMatch($a, $b);\n  const inputs: BatchMatMulInputs = {a: $a, b: $b};\n  const attrs: BatchMatMulAttrs = {transposeA, transposeB};\n  return ENGINE.runKernel(\n    BatchMatMul, inputs as {\n      } as NamedTensorMap, attrs as {\n      } as NamedAttrMap);\n  }\n\nexport const matMul = op({matMul_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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\n
*/\nimport {ENGINE} from './engine';\nimport {OneHot, OneHotAttrs, OneHotInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Creates a one-hot `tf.Tensor`. The locations represented by `indices` take\n * value `onValue` (defaults to 1), while all other locations take value\n * `offValue` (defaults to 0). If `indices` is rank `R`, the output has rank\n * `R+1` with the last axis of size `depth`.\n *

```

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*\n * ``js\n * tf.oneHot(tf.tensor1d([0, 1], 'int32'), 3).print();\n * ``\n * @param indices `tf.Tensor` of indices with dtype `int32`.\n * @param depth The depth of the one hot dimension.\n * @param onValue A number used to fill in the output when the index matches\n * the location.\n * @param offValue A number used to fill in the output when the index does\n * not match the location.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\nfunction oneHot_(\n  indices: Tensor|TensorLike, depth: number, onValue = 1,\n  offValue = 0): Tensor {\n  if (depth < 2) {\n    throw new Error(`Error in oneHot: depth must be >=2, but it is ${depth}`);\n  }\n  const $indices = convertToTensor(indices, 'indices', 'oneHot', 'int32');\n  const inputs: OneHotInputs = {indices: $indices};\n  const attrs: OneHotAttrs = {depth, onValue, offValue};\n  return ENGINE.runKernel(\n    OneHot, inputs as unknown as NamedTensorMap,\n    attrs as unknown as NamedAttrMap);\n}\n\nexport const oneHot = op({oneHot_});\n"/**\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {ENGINE} from '../engine';\nimport {Transpose, TransposeAttrs, TransposeInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from '../operation';\n\n/**\n * Transposes the `tf.Tensor`. Permutes the dimensions according to `perm`.\n * The returned `tf.Tensor`'s dimension `i` will correspond to the input\n * dimension `perm[i]`. If `perm` is not given, it is set to `[n-1...0]`,\n * where `n` is the rank of the input `tf.Tensor`. Hence by default, this\n * operation performs a regular matrix transpose on 2-D input\n * `tf.Tensor`s.\n *``js\n * const a = tf.tensor2d([1, 2, 3, 4, 5, 6], [2, 3]);\n * a.transpose().print(); // or\n * tf.transpose(a)\n *``\n * @param x The tensor to transpose.\n * @param perm The permutation of the dimensions of a.\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n *\nfunction transpose_<T extends Tensor>(x: T|TensorLike, perm?: number[]): T {\n  const $x = convertToTensor(x, 'x', 'transpose');\n  if (perm == null) {\n    perm = $x.shape.map((s, i) => i).reverse();\n  }\n  util.assert(\n    $x.rank === perm.length,\n    () => `Error in transpose: rank of input ${$x.rank} ` +\n    `must match length of perm ${perm}.`);\n  perm.forEach(axis => {\n    util.assert(\n      axis >= 0 && axis < $x.rank,\n      () => `All entries in 'perm' must be between 0 and ${$x.rank - 1}` +\n      `but got ${perm}`);\n  });\n  if ($x.rank <= 1) {\n    return $x.clone();\n  }\n  const inputs: TransposeInputs = {x: $x};\n  const attrs: TransposeAttrs = {perm};\n  return ENGINE.runKernel(\n    Transpose, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const transpose = op({transpose_});\n"/**\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {cast} from '../cast';\nimport {matMul} from '../mat_mul';\nimport {oneHot} from '../one_hot';\nimport {op} from '../operation';\nimport {transpose} from '../transpose';\n\n/**\n * Computes the confusion matrix from true labels and predicted labels.\n *``js\n * const labels = tf.tensor1d([0, 1, 2, 1, 0], 'int32');\n * const predictions = tf.tensor1d([0, 2, 2, 1, 0], 'int32');\n * const numClasses = 3;\n * const out = tf.math.confusionMatrix(labels, predictions, numClasses);\n * out.print();\n * //

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```

Expected output matrix:\n * // [[2, 0, 0],\n * // [0, 1, 1],\n * // [0, 0, 1]]\n * ```\n * \n * @param labels The target labels, assumed to be 0-based integers\n * for the classes. The shape is `[numExamples]`, where\n * `numExamples` is the number of examples included.\n * @param predictions The predicted classes, assumed to be\n * 0-based integers for the classes. Must have the same shape as `labels`.\n * @param numClasses Number of all classes, as an integer.\n * Its value must be larger than the largest element in `labels` and\n * `predictions`.\n * @returns The confusion matrix as a int32-type 2D tensor. The value at\n * row `r` and column `c` is the number of times examples of actual class\n * `r` were predicted as class `c`.\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n * ^/nexport function confusionMatrix_(\n * labels: Tensor1D|TensorLike, predictions:\n * Tensor1D|TensorLike, numClasses: number): Tensor2D {\n * const $labels = convertToTensor(labels, 'labels',\n * 'confusionMatrix');\n * const $predictions =\n * convertToTensor(predictions, 'predictions', 'confusionMatrix');\n * util.assert(\n * numClasses == null || numClasses > 0 && Number.isInteger(numClasses),\n * () => `If provided, numClasses must be a positive integer,`\n * ` +\n * `but got ${numClasses}`);\n * util.assert(\n * $labels.rank ===\n * 1,\n * () => `Expected the rank of labels to be 1, but got ${$labels.rank}`);\n * util.assert(\n * $predictions.rank\n * === 1,\n * () => `Expected the rank of predictions to be 1,`\n * ` +\n * `but got ${$predictions.rank}`);\n * util.assert(\n * $labels.shape[0] === $predictions.shape[0],\n * () => `Mismatch in the number of examples:`\n * ` +\n * `${$labels.shape[0]} vs. ${$predictions.shape[0]}`.\n * ` +\n * `Labels and predictions should have the same\n * number of elements.`);\n * util.assert(\n * numClasses > 0 && Number.isInteger(numClasses),\n * () =>\n * `numClasses is required to be a positive integer, but got`\n * ` +\n * `${numClasses}`);\n * // TODO(cais): In the future, if oneHot supports tensors inputs for\n * // `numClasses`, `confusionMatrix` can make `numClasses`\n * optional.\n * const oneHotLabels = oneHot(cast($labels, 'int32'), numClasses) as Tensor2D;\n * const\n * oneHotPredictions =\n * oneHot(cast($predictions, 'int32'), numClasses) as Tensor2D;\n * const oneHotLabelsT:\n * Tensor2D = transpose(oneHotLabels);\n * const product: Tensor2D = matMul(oneHotLabelsT, oneHotPredictions);\n * return cast(product, 'int32');\n * }\n * ^/nexport const confusionMatrix = op({ confusionMatrix_ });\n * ^/n\n * @license\n * * Copyright 2018 Google LLC. All Rights Reserved.\n * * Licensed under the Apache License, Version 2.0 (the\n * * `License`);\n * * you may not use this file except in compliance with the License.\n * * You may obtain a copy of the\n * * License at\n * * http://www.apache.org/licenses/LICENSE-2.0\n * * Unless required by applicable law or\n * * agreed to in writing, software\n * * distributed under the License is distributed on an `AS IS` BASIS,\n * * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * * See the License for\n * * the specific language governing permissions and\n * * limitations under the License.\n * ^/n\n * =====\n * ^/n\n * * Exports under the tf.math.* namespace.\n * ^/n\n * import { confusionMatrix } from\n * './ops/confusion_matrix';\n * ^/nexport { confusionMatrix };^/n\n * ^/n\n * @license\n * * Copyright 2018 Google LLC. All\n * * Rights Reserved.\n * * Licensed under the Apache License, Version 2.0 (the `License`);\n * * you may not use this\n * * file except in compliance with the License.\n * * You may obtain a copy of the License at\n * * http://www.apache.org/licenses/LICENSE-2.0\n * * Unless required by applicable law or agreed to in writing,\n * * software\n * * distributed under the License is distributed on an `AS IS` BASIS,\n * * WITHOUT WARRANTIES\n * * OR CONDITIONS OF ANY KIND, either express or implied.\n * * See the License for the specific language\n * * governing permissions and\n * * limitations under the License.\n * ^/n\n * =====\n * ^/n\n * import { Tensor3D } from './tensor';\n * import { inferShape } from './tensor_util_env';\n * import { TensorLike3D }\n * from './types';\n * import { DataType } from './types';\n * import { assertNonNull } from './util';\n * import { makeTensor }\n * from './tensor_ops_util';\n * ^/n\n * * Creates rank-3 `tf.Tensor` with the provided values, shape and dtype.\n * * \n * * The same functionality can be achieved with `tf.tensor`, but in general\n * * we recommend using `tf.tensor3d` as it makes\n * * the code more readable.\n * * \n * * ```\n * * // Pass a nested array.\n * * tf.tensor3d([[[[1], [2]], [[3], [4]]]).print();\n * * ```\n * * \n * * ```\n * * // Pass a flat array and specify a shape.\n * * tf.tensor3d([1, 2, 3, 4], [2, 2, 1]).print();\n * * ```\n * * \n * * @param values The values of the tensor. Can be nested array of numbers,\n * * or a flat array, or a `TypedArray`.\n * * \n * * @param shape The shape of the tensor. If not provided, it is inferred from\n * * `values`.\n * * \n * * @param dtype The\n * * data type.\n * * \n * * @doc {heading: 'Tensors', subheading: 'Creation'}\n * ^/nexport function tensor3d(\n * values:

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TensorLike3D, shape?: [number, number, number],\n  dtype?: DataType): Tensor3D {\n  assertNonNull(values);\n  if (shape != null && shape.length !== 3) {\n    throw new Error('tensor3d() requires shape to have three numbers');\n  }\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 3 && inferredShape.length !==\n  1) {\n    throw new Error(\n      'tensor3d() requires values to be number[][][] or flat/TypedArray');\n  }\n  if\n  (inferredShape.length === 1 && shape == null) {\n    throw new Error(\n      'tensor3d() requires shape to be\n  provided when `values` '+\n      'are a flat array');\n  }\n  return makeTensor(values, shape, inferredShape, dtype) as\n  Tensor3D;\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the\n  Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n  implied.\n * See the License for the specific language governing permissions and\n  limitations under the\n  License.\n *

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {FromPixels, FromPixelsAttrs, FromPixelsInputs} from\n './kernel_names';\nimport {getKernel, NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor2D,\n Tensor3D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {PixelData, TensorLike} from './types';\nimport {cast} from './cast';\nimport {op}\n from './operation';\nimport {tensor3d} from './tensor3d';\n\nlet fromPixels2DContext:\n CanvasRenderingContext2D;\n\n/**\n * Creates a `tf.Tensor` from an image.\n * ```js\n * const image = new\n  ImageData(1, 1);\n * image.data[0] = 100;\n * image.data[1] = 150;\n * image.data[2] = 200;\n * image.data[3] =\n  255;\n * tf.browser.fromPixels(image).print();\n * ```\n * @param pixels The input image to construct the\n  tensor from. The\n * supported image types are all 4-channel. You can also pass in an image\n * object with\n  following attributes:\n * `{data: Uint8Array; width: number; height: number}`\n * @param numChannels The\n  number of channels of the output tensor. A\n * numChannels value less than 4 allows you to ignore channels.\n  Defaults to\n * 3 (ignores alpha channel of input image).\n * @doc {heading: 'Browser', namespace: 'browser',\n  ignoreCI: true}\n */\nfunction fromPixels_(\n  pixels:\n  PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n  HTMLVideoElement|ImageBitmap,\n  numChannels = 3): Tensor3D {\n  // Sanity checks.\n  if (numChannels > 4) {\n    throw new Error(\n      'Cannot\n  construct Tensor with more than 4 channels from pixels.);\n  }\n  if (pixels == null) {\n    throw new Error('pixels\n  passed to tf.browser.fromPixels() can not be null');\n  }\n  let isPixelData = false;\n  let isImageData = false;\n  let\n  isVideo = false;\n  let isImage = false;\n  let isCanvasLike = false;\n  let isImageBitmap = false;\n  if ((pixels as\n  PixelData).data instanceof Uint8Array) {\n    isPixelData = true;\n  } else if (\n  typeof (ImageData) !==\n  'undefined' && pixels instanceof ImageData) {\n    isImageData = true;\n  } else if (\n  typeof\n  (HTMLVideoElement) !== 'undefined' &&\n  pixels instanceof HTMLVideoElement) {\n    isVideo = true;\n  }\n  else if (\n  typeof (HTMLImageElement) !== 'undefined' &&\n  pixels instanceof HTMLImageElement) {\n    isImage = true;\n    // tslint:disable-next-line: no-any\n  } else if ((pixels as any).getContext != null) {\n    isCanvasLike = true;\n  } else if (\n  typeof (ImageBitmap) !== 'undefined' &&\n  pixels instanceof\n  ImageBitmap) {\n    isImageBitmap = true;\n  } else {\n    throw new Error(\n      'pixels passed to\n  tf.browser.fromPixels() must be either an '+\n      'HTMLVideoElement, HTMLImageElement,\n  HTMLCanvasElement, ImageData` '+\n      'in browser, or OffscreenCanvas, ImageData in webworker` '+\n      'or {data: Uint32Array, width: number, height: number},`\n      'but was ${((pixels as {}).constructor.name)});\n  }\n  if (isVideo) {\n    const HAVE_CURRENT_DATA_READY_STATE = 2;\n    if (isVideo &&\n    (pixels as\n    HTMLVideoElement).readyState <\n    HAVE_CURRENT_DATA_READY_STATE) {\n      throw new\n      Error(\n        'The video element has not loaded data yet. Please wait for '\n        'loadeddata` event on the\n      <video> element.);\n    }\n  }\n  // If the current backend has 'FromPixels' registered, it has a more\n  // efficient way\n  of handling pixel uploads, so we call that.\n  const kernel = getKernel(FromPixels, ENGINE.backendName);\n  if\n  (kernel != null) {\n    const inputs: FromPixelsInputs = {pixels};\n    const attrs: FromPixelsAttrs =

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{numChannels});\n return ENGINE.runKernel(\n FromPixels, inputs as {} as NamedTensorMap,\n attrs
as {} as NamedAttrMap);\n }\n\n const [width, height] = isVideo ?\n [\n (pixels as
HTMLVideoElement).videoWidth,\n (pixels as HTMLVideoElement).videoHeight\n ]:\n [pixels.width,
pixels.height];\n let vals: Uint8ClampedArray|Uint8Array;\n\n if (isCanvasLike) {\n vals =\n // tslint:disable-
next-line:no-any\n (pixels as any).getContext('2d').getImageData(0, 0, width, height).data;\n } else if
(isImageData || isPixelData) {\n vals = (pixels as PixelData | ImageData).data;\n } else if (isImage || isVideo ||
isImageBitmap) {\n if (fromPixels2DContext === null) {\n fromPixels2DContext =
document.createElement('canvas').getContext('2d');\n }\n fromPixels2DContext.canvas.width = width;\n
fromPixels2DContext.canvas.height = height;\n fromPixels2DContext.drawImage(\n pixels as
HTMLVideoElement, 0, 0, width, height);\n vals = fromPixels2DContext.getImageData(0, 0, width,
height).data;\n }\n let values: Int32Array;\n if (numChannels === 4) {\n values = new Int32Array(vals);\n } else
{\n const numPixels = width * height;\n values = new Int32Array(numPixels * numChannels);\n for (let i = 0;
i < numPixels; i++) {\n for (let channel = 0; channel < numChannels; ++channel) {\n values[i *
numChannels + channel] = vals[i * 4 + channel];\n }\n }\n }\n const outShape: [number, number, number] =
[height, width, numChannels];\n return tensor3d(values, outShape, 'int32');\n}\n\n/**\n * Draws a `tf.Tensor` of
pixel values to a byte array or optionally a\n * canvas.\n * When the dtype of the input is 'float32', we assume
values in the range\n * [0-1]. Otherwise, when input is 'int32', we assume values in the range\n * [0-255].\n * Returns a promise that resolves when the canvas has been drawn to.\n * @param img A rank-2 or rank-3 tensor.
If rank-2, draws grayscale. If\n * rank-3, must have depth of 1, 3 or 4. When depth of 1, draws\n * grayscale.
When depth of\n * the depth dimension corresponding to r, g, b and
alpha = 1. When depth of\n * 4, all four components of the depth dimension correspond to r, g, b, a.\n * @param
canvas The canvas to draw to.\n * @doc {heading: 'Browser', namespace: 'browser'}\n */\nexport async function
toPixels(\n img: Tensor2D|Tensor3D|TensorLike,\n canvas?: HTMLCanvasElement):
Promise<Uint8ClampedArray> {\n let $img = convertToTensor(img, 'img', 'toPixels');\n if (!(img instanceof
Tensor)) {\n // Assume int32 if user passed a native array.\n const originalImgTensor = $img;\n $img =
cast(originalImgTensor, 'int32');\n originalImgTensor.dispose();\n }\n if ($img.rank !== 2 && $img.rank !== 3)
{\n throw new Error(\n `toPixels only supports rank 2 or 3 tensors, got rank ${$img.rank}.`);\n }\n const
[height, width] = $img.shape.slice(0, 2);\n const depth = $img.rank === 2 ? 1 : $img.shape[2];\n\n if (depth > 4 ||
depth === 2) {\n throw new Error(\n `toPixels only supports depth of size ` +\n `1, 3 or 4 but got
${depth}`);\n }\n\n if ($img.dtype !== 'float32' && $img.dtype !== 'int32') {\n throw new Error(\n
`Unsupported type for toPixels: ${$img.dtype}.` +\n ` Please use float32 or int32 tensors.`);\n }\n\n const data
= await $img.data();\n const multiplier = $img.dtype === 'float32' ? 255 : 1;\n const bytes = new
Uint8ClampedArray(width * height * 4);\n\n for (let i = 0; i < height * width; ++i) {\n const rgba = [0, 0, 0,
255];\n\n for (let d = 0; d < depth; d++) {\n const value = data[i * depth + d];\n\n if ($img.dtype ===
'float32') {\n if (value < 0 || value > 1) {\n throw new Error(\n `Tensor values for a float32 Tensor
must be in the ` +\n `range [0 - 1] but encountered ${value}.`);\n }\n } else if ($img.dtype ===
'int32') {\n if (value < 0 || value > 255) {\n throw new Error(\n `Tensor values for a int32 Tensor
must be in the ` +\n `range [0 - 255] but encountered ${value}.`);\n }\n }\n\n if (depth === 1) {\n
rgba[0] = value * multiplier;\n rgba[1] = value * multiplier;\n rgba[2] = value * multiplier;\n } else
{\n rgba[d] = value * multiplier;\n }\n }\n\n const j = i * 4;\n bytes[j + 0] = Math.round(rgba[0]);\n
bytes[j + 1] = Math.round(rgba[1]);\n bytes[j + 2] = Math.round(rgba[2]);\n bytes[j + 3] =
Math.round(rgba[3]);\n }\n\n if (canvas !== null) {\n canvas.width = width;\n canvas.height = height;\n const
ctx = canvas.getContext('2d');\n const imageData = new ImageData(bytes, width, height);\n
ctx.putImageData(imageData, 0, 0);\n }\n if ($img !== img) {\n $img.dispose();\n }\n return bytes;\n}\n\nexport
const fromPixels = op({fromPixels_});\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\nimport {TensorInfo} from './kernel_registry';\nimport {computeStrides, sizeFromShape} from './util';\n\n**\n * Validate gather nd inputs.\n * @param tensor The tensor contains the source values.\n * @param indices The tensor contains the indices to slice the source.\n * @returns [resultShape, numUpdates, sliceSize, strides]\n\n**\nexport function prepareAndValidate(tensor: TensorInfo, indices: TensorInfo):\n [number[], number, number, number[]] {\n  const tensorRank = tensor.shape.length;\n  const indicesRank = indices.shape.length;\n  if (tensorRank < 1) {\n    throw new Error(\n      `tf.gatherND() expects the input to be rank 1 or higher,`\n      ` but the rank was ${tensorRank}.`);\n  }\n  if (indicesRank < 1) {\n    throw new Error(\n      `tf.gatherND() expects the indices to be rank 1 or higher,`\n      ` but the rank was ${indicesRank}.`);\n  }\n  if (indices.dtype !== 'int32') {\n    throw new Error(\n      `tf.gatherND() expects the indices to be int32 type,`\n      ` but the dtype was ${indices.dtype}.`);\n  }\n  if (indices.shape[indicesRank - 1] > tensorRank) {\n    throw new Error(\n      `index innermost dimension length must be <= tensor rank; saw: `);\n  }\n  if (sizeFromShape(tensor.shape) === 0) {\n    throw new Error(\n      `Requested more than 0 entries, but input is empty.`);\n  }\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n  // The result shape is\n  // indices.shape[:-1] + params.shape[indices.shape[-1]:]\n  let nResult = 1;\n  for (let i = 0; i < indicesShape.length - 1; ++i) {\n    nResult *= indicesShape[i];\n  }\n  const inputShape = tensor.shape;\n  const resultShape = indicesShape.slice();\n  resultShape.pop();\n  let sliceSize = 1;\n  for (let i = sliceRank; i < tensorRank; ++i) {\n    sliceSize *= inputShape[i];\n    resultShape.push(inputShape[i]);\n  }\n  const strides = [\n    ...computeStrides(tensor.shape).map(stride => stride / sliceSize),\n    1].slice(0, sliceRank);\n  return [resultShape, nResult, sliceSize, strides];\n}\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\nimport {TensorInfo} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {computeStrides, sizeFromShape} from './util';\n\n**\n * Check whether updates.shape = indices.shape[:batchDim] +\n * shape[sliceDim:].\n * @param x The input tensor.\n\n**\nexport function validateUpdateShape(\n  shape: number[], indices: Tensor, updates: Tensor) {\n  const sliceDim = (indices.rank > 1) ? indices.shape[indices.rank - 1] : 1;\n  const batchDim = (indices.rank > 1) ? indices.rank - 1 : 1;\n  const shapeError = 'Must have updates.shape = indices.shape[:batchDim] + ` shape[sliceDim:], got updates.shape: ` +\n ` indices.shape: ${indices.shape}, shape: ${shape} ` +\n ` sliceDim: ${sliceDim}, and batchDim: ${batchDim}.`;\n  if (updates.rank < batchDim) {\n    throw new Error(shapeError + ` update.rank < ${batchDim}.`);\n  }\n  if (shape.length < sliceDim + (updates.rank - batchDim)) {\n    throw new Error(\n      shapeError +\n      ` Output shape length < ${sliceDim + (updates.rank - batchDim)}.`);\n  }\n  if (updates.rank !== batchDim + shape.length - sliceDim) {\n    throw new Error(\n      shapeError +\n      ` update.rank != ${batchDim + shape.length - sliceDim}.`);\n  }\n  for (let d = 0; d < batchDim; ++d) {\n    if (updates.shape[d] !== indices.shape[d]) {\n      throw new Error(\n        shapeError +\n        ` updates.shape[${d}] (${updates.shape[d]}) != indices.shape[${d}] (${indices.shape[d]}).`);\n    }\n  }\n  for (let d = 0; d < updates.rank - batchDim; ++d) {\n    if (updates.shape[d + batchDim] !== shape[d + sliceDim]) {\n      throw new Error(\n        shapeError +\n        ` updates.shape[${d + batchDim}] (${updates.shape[d + batchDim]}) != shape[${d + batchDim}] (${shape[d + batchDim]}).`);\n    }\n  }\n}\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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sliceRank: number;\n numUpdates: number;\n sliceSize: number;\n strides: number[];\n outputSize:
number;\n}\n/**\n * Validate scatter nd inputs.\n *\n * @param update The tensor contains the update values.\n *\n * @param indices The tensor contains the indices for the update values.\n *\n * @param shape The shape of the output
tensor.\n */\nexport function validateInput(\n  updates: Tensor, indices: Tensor, shape: number[]) {\n  if
(indices.rank < 1) {\n    throw new Error(\n      `tf.scatterND() expects the indices to be rank 1 or higher,` +\n
      `but the rank was ${indices.rank}.`);\n  }\n  if (updates.rank < 1) {\n    throw new Error(\n      `tf.scatterND() expects
the updates to be rank 1 or higher,` +\n      `but the rank was ${updates.rank}.`);\n  }\n  if (indices.dtype !==
'int32') {\n    throw new Error(`The dtype of 'indices' should be int32, but got dtype: ${\n      indices.dtype}`);\n  }\n
  if (shape.length < 1) {\n    throw new Error(\n      `Output rank must be greater or equal to 1, but got shape:
${shape}`);\n  }\n}\n\n if (shape.length === 0) {\n  if (indices.size === 0) {\n    throw new Error(`Indices specified
for empty output. indices shape: ${\n      indices.shape}`);\n  }\n  if (updates.size === 0) {\n    throw new
Error(`Updates specified for empty output. updates shape: ${\n      updates.shape}`);\n  }\n}\n}\n\n
validateUpdateShape(shape, indices, updates);\n}\n}\n/**\n * Calculate the shape information for the output.\n *\n *
@param update The tensor contains the update values.\n *\n * @param indices The tensor contains the indices for the
update values.\n *\n * @param shape The shape of the output tensor.\n *\n * @returns ScatterShapeInfo\n */\nexport
function calculateShapes(\n  updates: TensorInfo, indices: TensorInfo,\n  shape: number[]): ScatterShapeInfo {\n
  // Calculate the number of dimensions in indices\n  const indicesRank = indices.shape.length;\n  const sliceRank =
(indicesRank > 1) ? indices.shape[indicesRank - 1] : 1;\n\n  // Calculate the number of elements that make up each
slice of our updated\n  // tensor. This allows us to work with flattened tensors and copy over whole\n  // slices at a
time.\n  const totalNd = shape.length;\n\n  let sliceSize = 1;\n  for (let i = sliceRank; i < totalNd; ++i) {\n    sliceSize
*= shape[i];\n  }\n\n  const safeSliceDim = (sliceRank < 1) ? 1 : sliceRank;\n  const numUpdates =
sizeFromShape(indices.shape) / safeSliceDim;\n\n  const strides = [...computeStrides(shape.slice(0, sliceRank)),
1];\n  const outputSize = sizeFromShape(shape);\n  return {sliceRank, numUpdates, sliceSize, strides,
outputSize};\n}\n}\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *\n
=====\n\n\n*\n\nimport {TensorInfo} from './kernel_registry';\nimport * as util from './util';\n\nexport type SliceInfo = {\n
nonStrided: boolean,\n $begin: number[],\n $end: number[],\n $strides: number[],\n size: number[],\n newShape:
number[],\n outShape: number[]};\n\nexport function assertParamsValid(\n  input: TensorInfo, begin: number[],
size: number[]): void {\n  const inputRank = input.shape.length;\n  util.assert(\n    inputRank === begin.length,\n
() => `Error in slice${inputRank}D: Length of begin ${begin} must ` +\n      `match the rank of the array
(${inputRank}).`);\n  util.assert(\n    inputRank === size.length,\n    () => `Error in slice${inputRank}D: Length
of size ${size} must ` +\n      `match the rank of the array (${inputRank}).`);\n\n  for (let i = 0; i < inputRank;
++i) {\n    util.assert(\n      begin[i] + size[i] <= input.shape[i],\n      () => `Error in slice${inputRank}D:\n
begin[${i}] + size[${i}] ` +\n      `(${begin[i] + size[i]}) would overflow input.shape[${i}] (${input.shape[i]})`);\n  }\n}\n\n/**\n * Converts a binary mask to an array of axes. Used in stridedSlice().\n */\nexport
function maskToAxes(mask: number): number[] {\n  const axes = [];\n  let axis = 0;\n  while (mask > 0) {\n    if
(mask & 1) {\n      axes.push(axis);\n    }\n    mask /= 2;\n    axis++;\n  }\n  return axes;\n}\n\n/**\n * Computes the
output shape given the strided slice params.\n */\nexport function computeOutShape(\n  begin: number[], end:
number[], strides: number[]): number[] {\n  const size = [];\n  for (let axis = 0; axis < begin.length; axis++) {\n
size[axis] = Math.ceil((end[axis] - begin[axis]) / strides[axis]);\n  }\n  return size;\n}\n\n// Creates full selection at
the elided dimensions. If the dimension matches\n// the ellipsis mask, override the current stride value. Otherwise,
insert.\nexport function stridesWithElidedDims(\n  strides: number[], ellipsisInsertionIndex: number,

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masked axes, or the begin index is not set\n // for the axis.\n if (beginMask & 1 << axis || ellipsisMask & 1 << axis
|| start == null) {\n   if (stride > 0) {\n     // Forward iteration - use the first element. These values will get\n     //
clamped below (Note: We could have set them to 0 and axis_size-1, but\n     // use lowest() and max() to maintain
symmetry with StopForAxis())\n     start = Number.MIN_SAFE_INTEGER;\n   } else {\n     // Backward iteration
- use the last element.\n     start = Number.MAX_SAFE_INTEGER;\n   }\n }\n\n // Handle negative indices\n
const axisSize = inputShape[axis];\n if (start < 0) {\n   start += axisSize;\n }\n\n // Clamping\n start =
util.clamp(0, start, axisSize - 1);\n\n return start;\n}\n\nexport function stopForAxis(\n  endMask: number,
stopIndices: number[], strides: number[],\n  inputShape: number[], axis: number, ellipsisMask: number): number
{\n // Begin with the specified index\n let stop = stopIndices[axis];\n const stride = strides[axis] || 1;\n // Check
the axis bit from right of masked axes, or if the stop index is not\n // set for this axis.\n if (endMask & (1 << axis) ||
ellipsisMask & (1 << axis) || stop == null) {\n   if (stride > 0) {\n     // Forward iteration - use the last element.
These values will get\n     // clamped below\n     stop = Number.MAX_SAFE_INTEGER;\n   } else {\n     //
Backward iteration - use the first element.\n     stop = Number.MIN_SAFE_INTEGER;\n   }\n }\n\n // Handle
negative indices\n const axisSize = inputShape[axis];\n if (stop < 0) {\n   stop += axisSize;\n }\n\n // Clamping\n
// Because the end index points one past the last element, we need slightly\n // different clamping ranges depending
on the direction.\n if (stride > 0) {\n // Forward iteration\n stop = util.clamp(0, stop, axisSize);\n } else {\n //
Backward iteration\n stop = util.clamp(-1, stop, axisSize - 1);\n }\n\n return stop;\n}\n\n/**\n * Returns true if the
slice occupies a continuous set of elements in the\n * 'flat' space.\n */\nexport function isSliceContinuous(\n  shape:
number[], begin: number[], size: number[]) {\n // Index of the first axis that has size > 1.\n let firstNonOneAxis =
size.length;\n for (let i = 0; i < size.length; i++) {\n   if (size[i] > 1) {\n     firstNonOneAxis = i;\n     break;\n   }\n }\n\n for (let i = firstNonOneAxis + 1; i < size.length; i++) {\n   if (begin[i] > 0 || size[i] !== shape[i]) {\n     return
false;\n   }\n }\n\n return true;\n}\n\nexport function computeFlatOffset(begin: number[], strides: number[]): number
{\n let flatOffset = begin.length > 0 ? begin[begin.length - 1] : 1;\n for (let i = 0; i < begin.length - 1; i++) {\n
flatOffset += begin[i] * strides[i];\n }\n\n return flatOffset;\n}\n\nexport function parseSliceParams(\n  x:
TensorInfo, begin: number|number[], size?: number|number[]) {\n // The following logic allows for more
ergonomic calls.\n let begin_: number[];\n const xRank = x.shape.length;\n if (typeof begin === 'number') {\n
begin_ = [begin, ...new Array(xRank - 1).fill(0)];\n } else if (begin.length < xRank) {\n   begin_ =
begin.concat(new Array(xRank - begin.length).fill(0));\n } else {\n   begin_ = begin.slice();\n }\n\n
begin_.forEach(d => {\n   util.assert(\n     d !== -1, () => 'slice() does not support negative begin indexing.);\n
});\n let size_: number[];\n if (size === null) {\n   size_ = new Array(xRank).fill(-1);\n } else if (typeof size ===
'number') {\n   size_ = [size, ...new Array(xRank - 1).fill(-1)];\n } else if (size.length < xRank) {\n   size_ =
size.concat(new Array(xRank - size.length).fill(-1));\n } else {\n   size_ = size;\n }\n\n size_ = size_.map((d, i) =>
{\n   if (d >= 0) {\n     return d;\n   } else {\n     util.assert(\n       d === -1,\n       () => `Negative size values
should be exactly -1 but got ` +\n       ` ${d} for the slice() size at index ${i}.`);\n     return x.shape[i] -
begin_[i];\n   }\n });\n return [begin_, size_];\n}\n\nexport function sliceInfo(\n  xShape: number[], begin:
number[], end: number[], strides: number[],\n  beginMask: number, endMask: number, ellipsisMask: number,\n  newAxisMask: number, shrinkAxisMask: number): SliceInfo {\n // make a copy because it may be modified further
down.\n let $begin = begin.slice();\n let $end = end.slice();\n let $strides = strides;\n if (strides === null) {\n
$strides = new Array($begin.length);\n }\n\n const ellipsisAxes = maskToAxes(ellipsisMask);\n if
(ellipsisAxes.length > 1) {\n   throw new Error('Multiple ellipses in slice is not allowed.);\n }\n\n if (ellipsisMask
!== 0 && newAxisMask !== 0) {\n   throw new Error(\n     'Using both ellipsisMask and newAxisMask is not yet
supported.);\n }\n\n if (ellipsisMask !== 0 && shrinkAxisMask !== 0) {\n   throw new Error(\n     'Using both
ellipsisMask and shrinkAxisMask is not yet supported.);\n }\n\n const numInterpolatedAxes = xShape.length -
$begin.length;\n\n // Expand the dims of x based on the newAxisMask.\n const expandAxes =
maskToAxes(newAxisMask);\n const newShape = xShape.slice();\n expandAxes.forEach(axis => {\n
newShape[axis] = 0;\n $end[axis] = 1;\n newShape.splice(axis, 0, 1);\n });\n\n const {\n   begin:
normalizedBegin,\n   end: normalizedEnd,\n   strides: normalizedStrides\n } =\n   getNormalizedAxes(\n
newShape, ellipsisAxes, numInterpolatedAxes, $begin, $end, $strides,\n     beginMask, endMask,

```

```

ellipsisMask);
$begin = normalizedBegin;
$end = normalizedEnd;
$strides = normalizedStrides;

const
shrinkAxes = maskToAxes(shrinkAxisMask); // Adjust the ends based on the shrink mask.
shrinkAxes.forEach(axis => {
    $end[axis] = $begin[axis] + 1;
    $strides[axis] = 1;
}); // Figure out the
output shape.
const size = computeOutShape($begin, $end, $strides); // Remove the axes based on
shrinkMask.
const outShape = size.filter((_, axis) => shrinkAxes.indexOf(axis) !== -1);
const nonStrided =
$strides.every(v => v === 1);
return {nonStrided, $begin, $end, $strides, size, newShape,
outShape};
}
}
"/**
 * @license
 * Copyright 2018 Google LLC. All Rights Reserved.
 * Licensed under the
 * Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the
 * License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed
 * on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 * implied.
 * See the License for the specific language governing permissions and
 * limitations under the
 * License.
 */

```

```

=====
*/
import {assert} from './util';

/**
 * Types to support JSON-esque data structures internally.
 * Internally ConfigDict's use camelCase keys and values where the
 * values are class names to be instantiated. On the python side, these
 * will be snake_case. Internally we allow Enums into the values for better
 * type safety, but these need to be converted to raw primitives (usually
 * strings) for round-tripping with python.
 * toConfig returns the TS-friendly representation. model.toJSON() returns
 * the pythonic version as that's the portable format. If you need to
 * python-ify a non-model level toConfig output, you'll need to use a
 * convertTsToPythonic from serialization_utils in -Layers.
 */
export declare type ConfigDictValue =
boolean | number | string | null | ConfigDictArray | ConfigDict;
export declare interface ConfigDict {
[key: string]: ConfigDictValue;
}
export declare interface ConfigDictArray extends Array<ConfigDictValue> {
}

/**
 * Type to represent the class-type of Serializable objects.
 * Ie the class prototype with access to the constructor and any
 * static members/methods. Instance methods are not listed here.
 * Source for this idea: https://stackoverflow.com/a/43607255
 */
export declare type SerializableConstructor<T extends
Serializable> = {
// tslint:disable-next-line:no-any
new (...args: any[]): T;
className: string;
fromConfig: FromConfigMethod<T>;
};
export declare type FromConfigMethod<T extends Serializable> =
(cls: SerializableConstructor<T>, config: ConfigDict) => T;

/**
 * Serializable defines the serialization contract.
 * TFJS requires serializable classes to return their className when asked
 * to avoid issues with minification.
 */
export abstract class Serializable {
/**
 * Return the class name for this class to use in
 * serialization contexts.
 * Generally speaking this will be the same thing that constructor.name
 * would have returned. However, the class name needs to be robust
 * against minification for serialization/deserialization to work properly.
 * There's also places such as initializers.VarianceScaling, where
 * implementation details between different languages led to different
 * class hierarchies and a non-leaf node is used for serialization purposes.
 */
getClassName(): string {
return (this.constructor as
SerializableConstructor<Serializable>).className;
}

/**
 * Return all the non-weight state needed
 * to serialize this object.
 */
abstract getConfig(): ConfigDict;

/**
 * Creates an instance of T from a
 * ConfigDict.
 * This works for most descendants of serializable. A few need to
 * provide special handling.
 * @param cls A Constructor for the class to instantiate.
 * @param config The Configuration for the object.
 */
/** @nocollapse */
static fromConfig<T extends Serializable>(
cls:
SerializableConstructor<T>, config: ConfigDict): T {
return new cls(config);
}
}

/**
 * Maps string keys to class constructors.
 * Used during (de)serialization from the cross-language JSON format, which
 * requires the class name in the serialization format matches the class
 * names as used in Python, should it exist.
 */
export class SerializationMap {
private static instance: SerializationMap;
classNameMap: {
[className: string]:
[SerializableConstructor<Serializable>, FromConfigMethod<Serializable>]
};

private constructor() {
this.classNameMap = {};
}

/**
 * Returns the singleton instance of the map.
 */
static getMap(): SerializationMap {
if (SerializationMap.instance == null) {
SerializationMap.instance

```

```

= new SerializationMap();\n  }\n  return SerializationMap.instance;\n }\n\n /**\n  * Registers the class as
serializable.\n  */\n  static register<T extends Serializable>(cls: SerializableConstructor<T>) {\n
SerializationMap.getMap().classNameMap[cls.className] =\n    [cls, cls.fromConfig];\n }\n}\n\n/**\n *
Register a class with the serialization map of TensorFlow.js.\n * This is often used for registering custom
Layers, so they can be\n * serialized and deserialized.\n * Example:\n * ```js\n * class MyCustomLayer
extends tf.layers.Layer {\n *   static className = 'MyCustomLayer';\n *   constructor(config) {\n *
super(config);\n *   }\n * }\n * tf.serialization.registerClass(MyCustomLayer);\n * ```\n * @param cls The class
to be registered. It must have a public static member\n * called `className` defined and the value must be a non-
empty string.\n * @doc {heading: 'Models', subheading: 'Serialization', ignoreCI: true}\n */\nexport function
registerClass<T extends Serializable>(cls: SerializableConstructor<T>) {\n  assert(\n    cls.className !==
null,\n    () => `Class being registered does not have the static className ` +\n      `property defined.`);\n  assert(\n    typeof cls.className === 'string',\n    () => `className is required to be a string, but got type ` +\n      `typeof cls.className);\n  assert(\n    cls.className.length > 0,\n    () => `Class being registered has an empty-
string as its className, ` +\n      `which is disallowed.`);\n  SerializationMap.register(cls);\n }\n\n",/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {inferShape} from './tensor_util_env';\nimport {RecursiveArray,
TensorLike, TypedArray} from './types';\nimport {arraysEqual, encodeString, flatten, isString, isTypedArray} from
 './util';\nconst TEST_EPSILON_FLOAT32 = 1e-3;\nexport const TEST_EPSILON_FLOAT16 = 1e-1;\n\nexport
function expectArraysClose(\n  actual: TypedArray|number|RecursiveArray<number>,\n  expected:
TypedArray|number|RecursiveArray<number>, epsilon?: number) {\n  if (epsilon == null) {\n    epsilon =
testEpsilon();\n  }\n  return expectArraysPredicate(\n    actual, expected, (a, b) => areClose(a as number, b as
number, epsilon));\n }\n\nexport function testEpsilon() {\n  return ENGINE.backend.floatPrecision() === 32 ?
TEST_EPSILON_FLOAT32 : \n    TEST_EPSILON_FLOAT16;\n }\n\nfunction
expectArraysPredicate(\n  actual: TensorLike, expected: TensorLike,\n  predicate: (a: {}, b: {}) => boolean) {\n
let checkClassType = true;\n  if (isTypedArray(actual) || isTypedArray(expected)) {\n    checkClassType = false;\n
  }\n  if (isTypedArray(actual) && isTypedArray(expected)) {\n    checkClassType = true;\n  }\n  if (checkClassType)
{\n    const aType = actual.constructor.name;\n    const bType = expected.constructor.name;\n    if (aType !==
bType) {\n      throw new Error(\n        `Arrays are of different type. Actual: ${aType}. ` +\n        `Expected:
${bType}`);\n    }\n  }\n  if (Array.isArray(actual) && Array.isArray(expected)) {\n    const actualShape =
inferShape(actual);\n    const expectedShape = inferShape(expected);\n    if (!arraysEqual(actualShape,
expectedShape)) {\n      throw new Error(\n        `Arrays have different shapes. ` +\n        `Actual:
[${actualShape}]. Expected: [${expectedShape}]`);\n    }\n  }\n  const actualFlat =\n    isTypedArray(actual) ?\n    actual : flatten(actual as RecursiveArray<number>);\n    const expectedFlat = isTypedArray(expected) ?\n    expected :\n    flatten(expected as RecursiveArray<number>);\n    if (actualFlat.length !== expectedFlat.length)
{\n      throw new Error(\n        `Arrays have different lengths actual: ${actualFlat.length} vs ` +\n        `expected:
${expectedFlat.length}.\\n` +\n        `Actual: ${actualFlat}.\\n` +\n        `Expected: ${expectedFlat}.`);\n    }\n    for
(let i = 0; i < expectedFlat.length; ++i) {\n      const a = actualFlat[i];\n      const e = expectedFlat[i];\n      if
(!predicate(a, e)) {\n        throw new Error(\n          `Arrays differ: actual[${i}] = ${a}, expected[${i}] = ${e}.\\n` +\n
          `Actual: ${actualFlat}.\\n` +\n          `Expected: ${expectedFlat}.`);\n      }\n    }\n  }\n}\n\nexport interface DoneFn
{\n  (): void;\n  fail: (message?: Error|string) => void;\n}\n\nexport function expectPromiseToFail(fn: () =>
Promise<{}>, done: DoneFn): void {\n  fn().then(() => done.fail(), () => done());\n }\n\nexport function
expectArraysEqual(actual: TensorLike, expected: TensorLike) {\n  const exp = typeof expected === 'string' || typeof

```


following properties:

- `numBytes``: Number of bytes allocated (undisposed) at this time.
- `numTensors``: Number of unique tensors allocated.
- `numDataBuffers``: Number of unique data buffers allocated (undisposed) at this time, which is the number of tensors (e.g. `a.reshape(newShape)`) makes a new Tensor that shares the same data buffer with `a`).
- `unreliable``: True if the memory usage is unreliable. See `reasons`` when `unreliable`` is true.
- `reasons``: `string[]`, reasons why the memory is unreliable, present if `unreliable`` is true.

WebGL Properties:

- `numBytesInGPU``: Number of bytes allocated (undisposed) in the GPU only at this time.

@doc {heading: 'Performance', subheading: 'Memory'}

memory(): `MemoryInfo` {`return ENGINE.memory();`};

Executes the provided function `f()` and returns a promise that resolves with information about the function's memory use:

- `newBytes``: the number of new bytes allocated
- `newTensors``: the number of new tensors created
- `peakBytes``: the peak number of bytes allocated
- `kernels``: an array of objects for each kernel involved that reports their input and output shapes, number of bytes used, and number of new tensors created.
- `kernelNames``: an array of unique strings with just the names of the kernels in the `kernels`` array.

```
js
const profile = await
tf.profile(() => {
  const x = tf.tensor1d([1, 2, 3]);
  let x2 = x.square();
  x2.dispose();
  x2 =
x.square();
  x2.dispose();
  return x;
});
console.log(`newBytes: ${profile.newBytes}`);
console.log(`newTensors: ${profile.newTensors}`);
console.log(`byte usage over all kernels:
${profile.kernels.map(k => k.totalBytesSnapshot)}`);

```

@doc {heading: 'Performance', subheading: 'Profile'}

profile(f: () => (TensorContainer | Promise<TensorContainer>)): `Promise<ProfileInfo>` {`return ENGINE.profile(f);`};

Executes the provided function `fn`` and after it is executed, cleans up all intermediate tensors allocated by `fn`` except those returned by `fn``. `fn`` must not return a Promise (async functions not allowed). The returned result can be a complex object.

Using this method helps avoid memory leaks. In general, wrap calls to operations in `tf.tidy`` for automatic memory cleanup.

NOTE: Variables do not get cleaned up when inside a `tidy()`. If you want to dispose variables, please use `tf.disposeVariables`` or call `dispose()` directly on variables.

```
js
// y = 2 ^ 2 + 1
const y = tf.tidy(() => {
  // a, b, and one will be cleaned up when the tidy ends.
  const one = tf.scalar(1);
  const a = tf.scalar(2);
  const b = a.square();
  console.log(`numTensors (in tidy): ` +
tf.memory().numTensors);
  // The value returned inside the tidy function will return
  // through the tidy, in this case to the variable y.
  return b.add(one);
});
console.log(`numTensors (outside tidy): ` +
tf.memory().numTensors);
y.print();

```

@param nameOrFn The name of the closure, or the function to execute.

If a name is provided, the 2nd argument should be the function.

If debug mode is on, the timing and the memory usage of the function will be tracked and displayed on the console using the provided name.

@param fn The function to execute.

@doc {heading: 'Performance', subheading: 'Memory'}

tidy<T extends TensorContainer>(nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>): T {`return ENGINE.tidy(nameOrFn, fn);`};

Disposes any `tf.Tensor``s found within the provided object.

@param container an object that may be a `tf.Tensor`` or may directly contain `tf.Tensor``s, such as a `Tensor[]`` or `{key: Tensor, ...}``. If the object is not a `tf.Tensor`` or does not contain `Tensors``, nothing happens. In general it is safe to pass any object here, except that `Promise``s are not supported.

@doc {heading: 'Performance', subheading: 'Memory'}

dispose(container: TensorContainer) {`const tensors = getTensorsInContainer(container);` `tensors.forEach(tensor => tensor.dispose());`};

Keeps a `tf.Tensor`` generated inside a `tf.tidy`` from being disposed automatically.

```
js
let b;
const y = tf.tidy(() => {
  const one = tf.scalar(1);
  const a = tf.scalar(2);
  // b will not be cleaned up
  by the tidy. a and one will be cleaned up
  // when the tidy ends.
  b = tf.keep(a.square());
  console.log(`numTensors (in tidy): ` + tf.memory().numTensors);
  // The value returned inside the tidy
  function will return
  // through the tidy, in this case to the variable y.
  return b.add(one);
});
console.log(`numTensors (outside tidy): ` + tf.memory().numTensors);
console.log('y:');
y.print();
console.log('b:');
b.print();

```

@param result The tensor to keep from being disposed.

@doc {heading: 'Performance', subheading: 'Memory'}

keep<T extends Tensor>(result: T): T {`return ENGINE.keep(result);`};

Executes `f()` and returns a promise that resolves with timing

information.
 * The result is an object with the following properties:
 * - `wallMs`: Wall execution time.
 * - `kernelMs`: Kernel execution time, ignoring data transfer. If using the WebGL backend and the query timer extension is not available, this will return an error object.
 * - On `WebGL` The following additional properties exist:
 * - `uploadWaitMs`: CPU blocking time on texture uploads.
 * - `downloadWaitMs`: CPU blocking time on texture downloads (readPixels).
 * ``js` const x = tf.randomNormal([20, 20]);` const time = await tf.time(() => x.matMul(x));` console.log(`kernelMs: \${time.kernelMs}, wallTimeMs: \${time.wallMs}`);`
 * @param f The function to execute and time.
 * @doc {heading: 'Performance', subheading: 'Timing'}
 * ^/next export function time(f: () => void): Promise<TimingInfo> {
 * return ENGINE.time(f);
 * }
 * Sets the backend (cpu, webgl, wasm, etc) responsible for creating tensors and executing operations on those tensors. Returns a promise that resolves to a boolean if the backend initialization was successful.
 * Note this disposes the current backend, if any, as well as any tensors associated with it. A new backend is initialized, even if it is of the same type as the previous one.
 * @param backendName The name of the backend. Currently supports `webgl|cpu` in the browser, `tensorflow` under node.js (requires tfjs-node), and `wasm` (requires tfjs-backend-wasm).
 * @doc {heading: 'Backends'}
 * ^/next export function setBackend(backendName: string): Promise<boolean> {
 * return ENGINE.setBackend(backendName);
 * }
 * Returns a promise that resolves when the currently selected backend (or the highest priority one) has initialized. Await this promise when you are using a backend that has async initialization.
 * @doc {heading: 'Backends'}
 * ^/next export function ready(): Promise<void> {
 * return ENGINE.ready();
 * }
 * Returns the current backend name (cpu, webgl, etc). The backend is responsible for creating tensors and executing operations on those tensors.
 * @doc {heading: 'Backends'}
 * ^/next export function getBackend(): string {
 * return ENGINE.backendName;
 * }
 * Removes a backend and the registered factory.
 * @doc {heading: 'Backends'}
 * ^/next export function removeBackend(name: string): void {
 * ENGINE.removeBackend(name);
 * }
 * Finds the backend registered under the provided name. Returns null if the name is not in the registry, or the registration hasn't finished yet.
 * ^/next export function findBackend(name: string): KernelBackend {
 * return ENGINE.findBackend(name);
 * }
 * Finds the backend factory registered under the provided name. Returns a function that produces a new backend when called. Returns null if the name is not in the registry.
 * ^/next export function findBackendFactory(name: string): () => KernelBackend | Promise<KernelBackend> {
 * return ENGINE.findBackendFactory(name);
 * }
 * Registers a global backend. The registration should happen when importing a module file (e.g. when importing `backend_webgl.ts`), and is used for modular builds (e.g. custom tfjs bundle with only webgl support).
 * @param factory The backend factory function. When called, it should return a backend instance, or a promise of an instance.
 * @param priority The priority of the backend (higher = more important). In case multiple backends are registered, the priority is used to find the best backend. Defaults to 1.
 * @return False if there is already a registered backend under this name, true if not.
 * @doc {heading: 'Backends'}
 * ^/next export function registerBackend(name: string, factory: () => KernelBackend | Promise<KernelBackend>, priority = 1): boolean {
 * return ENGINE.registerBackend(name, factory, priority);
 * }
 * Gets the current backend. If no backends have been initialized, this will attempt to initialize the best backend. Will throw an error if the highest priority backend has async initialization, in which case, you should call `await tf.ready()` before running other code.
 * @doc {heading: 'Backends'}
 * ^/next export function backend(): KernelBackend {
 * return ENGINE.backend;
 * }
 * Sets the global platform.
 * @param platformName The name of this platform.
 * @param platform A platform implementation.
 * ^/next export function setPlatform(platformName: string, platform: Platform) {
 * env().setPlatform(platformName, platform);
 * }
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```

=====
*\nimport {ENGINE} from './engine';\nimport {Add, AddInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {op} from './operation';\n\n/**\n * Adds two `tf.Tensor`s element-wise, A + B. Supports broadcasting.\n * \n *
 ```js\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.tensor1d([10, 20, 30, 40]);\n * a.add(b).print(); // or
 tf.add(a, b)\n * ```\n * \n * // Broadcast add a with b.\n * const a = tf.scalar(5);\n * const b = tf.tensor1d([10,
 20, 30, 40]);\n * a.add(b).print(); // or tf.add(a, b)\n * ```\n * \n * @param a The first `tf.Tensor` to add.\n * @param
 b The second `tf.Tensor` to add. Must have the same type as `a`.\n * \n * @doc {heading: 'Operations', subheading:
 'Arithmetic'}\n *\nfunction add_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a =
 convertToTensor(a, 'a', 'add');\n let $b = convertToTensor(b, 'b', 'add');\n [$a, $b] = makeTypesMatch($a, $b);\n\n
const inputs: AddInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Add, inputs as { } as
 NamedTensorMap);\n}\n\nexport const add = op({ add_ });\n", "/*\n * @license\n * Copyright 2020 Google LLC.
 All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
 http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {ENGINE} from './engine';\nimport {FloorDiv, FloorDivInputs} from './kernel_names';\nimport
 {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting.\n * The
 result is rounded with floor function.\n * \n *
 ```js\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b =
 tf.tensor1d([1, 2, 3, 4]);\n * a.floorDiv(b).print(); // or tf.div(a, b)\n * ```\n * \n * // Broadcast div a with
 b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n * a.floorDiv(b).print(); // or tf.floorDiv(a,
 b)\n * ```\n * \n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator.
 Must have the same dtype as\n * `a`.\n * \n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction
 floorDiv_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a,
 'a', 'floorDiv');\n let $b = convertToTensor(b, 'b', 'floorDiv');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const
 inputs: FloorDivInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(FloorDiv, inputs as { } as
 NamedTensorMap);\n}\n\nexport const floorDiv = op({ floorDiv_ });\n", "/*\n * @license\n * Copyright 2020
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
 may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
 http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

```

```

=====
*\nimport {ENGINE} from './engine';\nimport {RealDiv, RealDivInputs} from './kernel_names';\nimport
 {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {floorDiv} from './floorDiv';\nimport {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A /
 B. Supports broadcasting.\n * \n *
 ```js\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n *
 a.div(b).print(); // or tf.div(a, b)\n * ```\n * \n * // Broadcast div a with b.\n * const a = tf.tensor1d([2,
 4, 6, 8]);\n * const b = tf.scalar(2);\n * a.div(b).print(); // or tf.div(a, b)\n * ```\n * \n * @param a The first tensor
 as the numerator.\n * @param b The second tensor as the denominator. Must have the same dtype as\n * `a`.\n * \n *

```



```

@doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction div_<T extends Tensor>(a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'div');\n let $b =
convertToTensor(b, 'b', 'div');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'int32' && $b.dtype ===
'int32') {\n return floorDiv($a, $b);\n }\n\n const inputs: RealDivInputs = {a: $a, b: $b};\n const attrs = {};\n\n //
tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(RealDiv, inputs as {} as
NamedTensorMap, attrs) as T;\n}\n\nexport const div = op({div_});\n", "/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {Multiply, MultiplyInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from
 '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport
{op} from './operation';\n\n**\n * Multiplies two `tf.Tensor`s element-wise, A * B. Supports broadcasting.\n *\n *
We also expose `tf.mulStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same
shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.tensor1d([2, 3, 4,
5]);\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n *\n * // Broadcast mul a with b.\n * const a =
tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.scalar(5);\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n *\n * @param a
The first tensor to multiply.\n * @param b The second tensor to multiply. Must have the same dtype as `a`.\n *\n *

```

```

@doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction mul_<T extends Tensor>(a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'mul');\n let $b =
convertToTensor(b, 'b', 'mul');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: MultiplyInputs = {a: $a, b:
$b};\n\n return ENGINE.runKernel(Multiply, inputs as {} as NamedTensorMap);\n}\n\nexport const mul =
op({mul_});\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {Abs, AbsInputs, ComplexAbs, ComplexAbsInputs} from
 '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport
{convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from
 './operation';\n\n**\n * Computes absolute value element-wise: `abs(x)`\n *\n * ```js\n * const x = tf.tensor1d([-1, 2,
-3, 4]);\n * x.abs().print(); // or tf.abs(x)\n * ```\n *\n * @param x The input `tf.Tensor`.\n *\n * @doc {heading:
'Operations', subheading: 'Basic math'}\n *\nfunction abs_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'abs');\n\n if ($x.dtype === 'complex64') {\n const inputs: ComplexAbsInputs = {x: $x};\n
return ENGINE.runKernel(ComplexAbs, inputs as {} as NamedTensorMap);\n } else {\n const inputs:
AbsInputs = {x: $x};\n return ENGINE.runKernel(Abs, inputs as {} as NamedTensorMap);\n }\n}\n\nexport
const abs = op({abs_});\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

```

implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\nimport {ENGINE} from './engine';\nimport {Acos, AcosInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes acos of the input `tf.Tensor` element-wise: `acos(x)`\n *\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.acos().print(); // or tf.acos(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',\n subheading: 'Basic math'}\n */\nfunction acos<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'acos');\n const inputs: AcosInputs = {x: $x};\n return ENGINE.runKernel(Acos, inputs as { } as NamedTensorMap);\n}\n\nexport const acos = op({acos_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\nimport {ENGINE} from './engine';\nimport {Acosh, AcoshInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes the inverse hyperbolic cos of the input `tf.Tensor` element-wise:\n *\n * `acosh(x)`\n *\n * const x = tf.tensor1d([10, 1, 3, 5.7]);\n *\n * x.acosh().print(); // or tf.acosh(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',\n subheading: 'Basic math'}\n */\nfunction acosh<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'acosh');\n const inputs: AcoshInputs = {x: $x};\n return ENGINE.runKernel(Acosh, inputs as { } as NamedTensorMap);\n}\n\nexport const acosh = op({acosh_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\nimport {ENGINE} from './engine';\nimport {AddN, AddNInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\n\n/**\n * Adds a list of `tf.Tensor`'s element-wise, each with the same shape and dtype.\n *\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor1d([3, 4]);\n * const c = tf.tensor1d([5, 6]);\n *\n * tf.addN([a, b, c]).print();\n *\n * @param tensors A list of tensors with the same shape and dtype.\n *\n * @doc {heading: 'Operations',\n subheading: 'Arithmetic'}\n */\nfunction addN<T extends Tensor>(tensors: Array<T|TensorLike>): T {\n util.assert(\n Array.isArray(tensors),\n () => "The argument passed to tf.addN() must be a list of tensors");\n util.assert(\n tensors.length >= 1,\n () => "Must pass at least one tensor to tf.addN(), but got `+\n `${tensors.length}`");\n const $tensors =\n tensors.map((t, i) => convertToTensor(t, `tensors${i}`, 'addN'));\n const firstTensor = $tensors[0];\n $tensors.forEach(t => {\n if (t.dtype !== firstTensor.dtype) {\n throw new Error(\n "All tensors passed to tf.addN() must have the same dtype");\n }\n });\n $tensors.forEach(t => {\n if (!util.arraysEqual(t.shape, firstTensor.shape)) {\n throw new Error(\n "All tensors passed to tf.addN() must have the same shape");\n }\n });\n const inputs: AddNInputs = $tensors;\n return ENGINE.runKernel(AddN, inputs as { } as NamedTensorMap);\n}\n\nexport const addN =
```



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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the indices of the maximum values along an `axis`.\n *\n * The result has the same shape as `input` with the dimension along `axis`\n * removed.\n *\n * `js`\n * const x = tf.tensor1d([1, 2, 3]);\n * x.argmax().print(); // or tf.argmax(x)\n *\n * `js`\n * const x = tf.tensor2d([1, 2, 4, 3], [2, 2]);\n * const axis = 1;\n * x.argmax(axis).print(); // or tf.argmax(x, axis)\n *\n * @param x The input tensor.\n * @param axis The dimension to reduce. Defaults to 0 (outer-most dimension).\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction argMax_<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x = convertToTensor(x, 'x', 'argMax');\n const inputs: ArgMaxInputs = {x: $x};\n const attrs: ArgMaxAttrs = {axis};\n return ENGINE.runKernel(\n ArgMax, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const argMax = op({argMax_});\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {ArgMin, ArgMinAttrs, ArgMinInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the indices of the minimum values along an `axis`.\n *\n * The result has the same shape as `input` with the dimension along `axis`\n * removed.\n *\n * `js`\n * const x = tf.tensor1d([1, 2, 3]);\n * x.argmin().print(); // or tf.argmin(x)\n *\n * `js`\n * const x = tf.tensor2d([1, 2, 4, 3], [2, 2]);\n * const axis = 1;\n * x.argmin(axis).print(); // or tf.argmin(x, axis)\n *\n * @param x The input tensor.\n * @param axis The dimension to reduce. Defaults to 0 (outer-most dimension).\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction argMin_<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x = convertToTensor(x, 'x', 'argMin');\n const inputs: ArgMinInputs = {x: $x};\n const attrs: ArgMinAttrs = {axis};\n return ENGINE.runKernel(\n ArgMin, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const argMin = op({argMin_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Asin, AsinInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
```

```

asin of the input `tf.Tensor` element-wise: `asin(x)`\n *\n * ````js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.asin().print(); // or tf.asin(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\n * \nfunction asin_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'asin');\n const inputs: AsinInputs = {x: $x};\n return ENGINE.runKernel(Asin, inputs as { } as NamedTensorMap);\n}\n\nexport const asin = op({ asin_ });\n", /*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Asinh, AsinhInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes inverse hyperbolic sin of the input `tf.Tensor` element-wise:\n * `asinh(x)`\n *\n * ````js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.asinh().print(); // or tf.asinh(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\n * \nfunction asinh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'asinh');\n const inputs: AsinhInputs = {x: $x};\n return ENGINE.runKernel(Asinh, inputs as { } as NamedTensorMap);\n}\n\nexport const asinh = op({ asinh_ });\n", /*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Atan, AtanInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes atan of the input `tf.Tensor` element-wise: `atan(x)`\n *\n * ````js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.atan().print(); // or tf.atan(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\n * \nfunction atan_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'atan');\n const inputs: AtanInputs = {x: $x};\n return ENGINE.runKernel(Atan, inputs as { } as NamedTensorMap);\n}\n\nexport const atan = op({ atan_ });\n", /*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Atan2, Atan2Inputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes arctangent of `tf.Tensor`s a / b element-wise: `atan2(a, b)`.\n * Supports broadcasting.\n *\n * ````js\n * const a = tf.tensor1d([1.0, 1.0, -1.0, .7]);\n * const b = tf.tensor1d([2.0, 13.0, 3.5, .21]);\n *\n * tf.atan2(a, b).print()\n *\n * @param a The first tensor.\n * @param b The second tensor.

```

```

Must have the same dtype as `a`.
@doc {heading: 'Operations', subheading: 'Basic math'}
function atan2_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {
 let $a = convertToTensor(a, 'a', 'atan2');
 let $b = convertToTensor(b, 'b', 'atan2');
 [$a, $b] = makeTypesMatch($a, $b);
 const inputs: Atan2Inputs = {a: $a, b: $b};
 return ENGINE.runKernel(Atan2, inputs as { } as NamedTensorMap);
}
export const atan2 = op({atan2_});
/**
 * @license
 * Copyright 2018 Google LLC. All Rights Reserved.
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 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
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 * software distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.

```

```

=====
import {ENGINE} from './engine';
import {Atanh, AtanhInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';
/**
 * Computes inverse hyperbolic tan of the input `tf.Tensor` element-wise:
 * `atanh(x)`
 * ```js
 * const x = tf.tensor1d([0, .1, -.1, .7]);
 * x.atanh().print(); // or tf.atanh(x)
 * ```
 * @param x The input tensor.
 * @doc {heading: 'Operations', subheading: 'Basic math'}
 * @function atanh_<T extends Tensor>(x: T|TensorLike): T {
 * const $x = convertToTensor(x, 'x', 'atanh');
 * const inputs: AtanhInputs = {x: $x};
 * return ENGINE.runKernel(Atanh, inputs as { } as NamedTensorMap);
 * }
 * export const atanh = op({atanh_});
 * /**
 * @license
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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 * limitations under the License.

```

```

=====
type PadType = 'SAME'|'VALID'|'NUMBER'|'EXPLICIT';
// For NHWC should be in the following form:
// [[0, 0], [pad_top, pad_bottom], [pad_left, pad_right], [0, 0]]
// For NCHW should be in the following form:
// [[0, 0], [0, 0], [pad_top, pad_bottom], [pad_left, pad_right]]
// Reference:
https://www.tensorflow.org/api_docs/python/tf/nn/conv2d
export type ExplicitPadding = [number, number], [number, number], [number, number], [number, number];
export type PadInfo = {
 top: number,
 left: number,
 right: number,
 bottom: number,
 type: PadType
};
export type PadInfo3D = {
 top: number,
 left: number,
 right: number,
 bottom: number,
 front: number,
 back: number,
 type: PadType
};
/**
 * Information about the forward pass of a convolution/pooling operation.
 * It includes input and output shape, strides, filter size and padding
 * information.
 * @export type Conv2DInfo = {
 batchSize: number,
 inHeight: number,
 inWidth: number,
 inChannels: number,
 outHeight: number,
 outWidth: number,
 outChannels: number,
 dataFormat: 'channelsFirst'|'channelsLast',
 strideHeight: number,
 strideWidth: number,
 dilationHeight: number,
 dilationWidth: number,
 filterHeight: number,
 filterWidth: number,
 effectiveFilterHeight: number,
 effectiveFilterWidth: number,
 padInfo: PadInfo,
 inShape: [number, number, number, number],
 outShape: [number, number, number, number],
 filterShape: [number, number, number, number]
};
/**
 * @param inputShape Input tensor shape is of the following dimensions:
 * `[batch, height, width, inChannels]`
 * @param filterShape The filter shape is of the following dimensions:
 * `[filterHeight, filterWidth, depth]`
 * @param strides The strides of the sliding window for each dimension of
 * the input tensor: `[strideHeight, strideWidth]`
 * If `strides` is a single number, then `strideHeight == strideWidth`
 * @param pad The type of padding algorithm.
 * - `same` and stride 1: output will be of same size as input,
 * regardless of filter size.
 * - `valid`: output will be smaller than input if filter is larger
 * than 1x1.
 * - For more info, see this guide:

```

```

[https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat The data format of the
input and output data.\n * Defaults to 'NHWC'.\n * @param dilations The dilation rates: `[dilationHeight,
dilationWidth]`.\n * Defaults to `[1, 1]`. If `dilations` is a single number, then\n * `dilationHeight ==
dilationWidth`.\n */\nexport function computeDilation2DInfo(\n inputShape: [number, number, number,
number],\n filterShape: [number, number, number], strides: number|[number, number],\n pad:
'same'|'valid'|number, dataFormat: 'NHWC' = 'NHWC',\n dilations: number|[number, number]) {\n //
`computerConv2DInfo` require filterShape to be in the dimension of:\n // `[filterHeight, filterWidth, depth,
outDepth]`, dilation2d doesn't have\n // outDepth, it should have the same depth as the input.\n // Input shape:
[batch, height, width, inChannels]\n const inputChannels = inputShape[3];\n const $filterShape =\n [...filterShape, inputChannels] as [number, number, number, number];\n const $dataFormat =
convertConv2DDataFormat(dataFormat);\n\n return computeConv2DInfo(\n inputShape, $filterShape, strides,
dilations, pad,\n null /* roundingMode */, null /* depthWise */, $dataFormat);\n}\n\nexport function
computePool2DInfo(\n inShape: [number, number, number, number],\n filterSize: [number, number]|number,
strides: number|[number, number],\n dilations: number|[number, number], pad: 'same'|'valid'|number,\n roundingMode?: 'floor'|'round'|'ceil',\n dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n
const [filterHeight, filterWidth] = parseTupleParam(filterSize);\n\n let filterShape: [number, number, number,
number];\n if (dataFormat === 'channelsLast') {\n filterShape = [filterHeight, filterWidth, inShape[3],
inShape[3]];\n } else if (dataFormat === 'channelsFirst') {\n filterShape = [filterHeight, filterWidth, inShape[1],
inShape[1]];\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n return
computeConv2DInfo(\n inShape, filterShape, strides, dilations, pad, roundingMode, false,\n dataFormat);\n}\n\n/**\n * Computes the information for a forward pass of a pooling3D operation.\n */\nexport
function computePool3DInfo(\n inShape: [number, number, number, number, number],\n filterSize:
number|[number, number, number],\n strides: number|[number, number, number],\n dilations: number|[number,
number, number], pad: 'same'|'valid'|number,\n roundingMode?: 'floor'|'round'|'ceil',\n dataFormat:
'NDHWC'|'NCDHW' = 'NDHWC'): Conv3DInfo {\n const [filterDepth, filterHeight, filterWidth] =
parse3TupleParam(filterSize);\n\n let filterShape: [number, number, number, number, number];\n let $dataFormat:
'channelsFirst'|'channelsLast';\n if (dataFormat === 'NDHWC') {\n $dataFormat = 'channelsLast';\n filterShape
=\n [filterDepth, filterHeight, filterWidth, inShape[4], inShape[4]];\n } else if (dataFormat === 'NCDHW') {\n
$dataFormat = 'channelsFirst';\n filterShape =\n [filterDepth, filterHeight, filterWidth, inShape[1],
inShape[1]];\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n return
computeConv3DInfo(\n inShape, filterShape, strides, dilations, pad, false, $dataFormat,\n roundingMode);\n}\n\n/**\n * Computes the information for a forward pass of a convolution/pooling\n *
operation.\n */\nexport function computeConv2DInfo(\n inShape: [number, number, number, number],\n filterShape: [number, number, number, number],\n strides: number|[number, number], dilations: number|[number,
number],\n pad: 'same'|'valid'|number|ExplicitPadding,\n roundingMode?: 'floor'|'round'|'ceil', depthwise =
false,\n dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n let [batchSize, inHeight,
inWidth, inChannels] = [-1, -1, -1, -1];\n if (dataFormat === 'channelsLast') {\n [batchSize, inHeight, inWidth,
inChannels] = inShape;\n } else if (dataFormat === 'channelsFirst') {\n [batchSize, inChannels, inHeight,
inWidth] = inShape;\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n\n const
[filterHeight, filterWidth, , filterChannels] = filterShape;\n const [strideHeight, strideWidth] =
parseTupleParam(strides);\n const [dilationHeight, dilationWidth] = parseTupleParam(dilations);\n\n const
effectiveFilterHeight =\n getEffectiveFilterSize(filterHeight, dilationHeight);\n const effectiveFilterWidth =\n getEffectiveFilterSize(filterWidth, dilationWidth);\n const {padInfo, outHeight, outWidth} = getPadAndOutInfo(\n
 pad, inHeight, inWidth, strideHeight, strideWidth, effectiveFilterHeight,\n effectiveFilterWidth,
roundingMode, dataFormat);\n\n const outChannels = depthwise ? filterChannels * inChannels : filterChannels;\n\n
let outShape: [number, number, number, number];\n if (dataFormat === 'channelsFirst') {\n outShape =
[batchSize, outChannels, outHeight, outWidth];\n } else if (dataFormat === 'channelsLast') {\n outShape =

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round((inputCols - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n\n return [outputDepths, outputRows,
outputCols, outChannels];\n}\n\nexport function computeDefaultPad(\n inputShape: [number, number][number,
number, number, number],\n fieldSize: number, stride: number, dilation = 1): number {\n const effectiveFieldSize
= getEffectiveFilterSize(fieldSize, dilation);\n return Math.floor(\n (inputShape[0] * (stride - 1) - stride +
effectiveFieldSize) / 2);\n}\n\nfunction parseTupleParam(param: number|number[]): [number, number, number] {\n
if (typeof param === 'number') {\n return [param, param, param];\n } \n if (param.length === 2) {\n return
[param[0], param[1], 1];\n } \n return param as [number, number, number];\n}\n\nfunction
parse3TupleParam(param: number|[number, number, number]):\n [number, number, number] {\n return typeof
param === 'number' ? [param, param, param] : param;\n}\n\n/* See
https://www.tensorflow.org/api_docs/python/tf/nn/atrous_conv2d\n * Atrous convolution is equivalent to standard
convolution with upsampled\n * filters with effective_filter_height =\n * filter_height + (filter_height - 1) * (dilation
- 1)\n * and effective_filter_width =\n * filter_width + (filter_width - 1) * (dilation - 1),\n * produced by inserting
dilation - 1 zeros along consecutive elements across\n * the filters' spatial dimensions.\n * When there is a dilation,
this converts a filter dimension to the\n * effective filter dimension, so it can be used in a standard convolution.\n
*\nfunction getEffectiveFilterSize(filterSize: number, dilation: number) {\n if (dilation <= 1) {\n return
filterSize;\n } \n\n return filterSize + (filterSize - 1) * (dilation - 1);\n}\n\nfunction getPadAndOutInfo(\n pad:
'same'|'valid'|number|ExplicitPadding, inHeight: number,\n inWidth: number, strideHeight: number, strideWidth:
number,\n filterHeight: number, filterWidth: number,\n roundingMode: 'floor'|'round'|'ceil',\n dataFormat:
'channelsFirst'|'channelsLast'): {padInfo: PadInfo, outHeight: number, outWidth: number} {\n let padInfo:
PadInfo;\n let outHeight: number;\n let outWidth: number;\n if (typeof pad === 'number') {\n const padType =
(pad === 0) ? 'VALID' : 'NUMBER';\n padInfo = {top: pad, bottom: pad, left: pad, right: pad, type: padType};\n
const outShape = computeOutputShape2D(\n [inHeight, inWidth], filterHeight, strideHeight, pad,
roundingMode);\n outHeight = outShape[0];\n outWidth = outShape[1];\n } else if (pad === 'same') {\n
outHeight = Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const
padAlongHeight =\n Math.max(0, (outHeight - 1) * strideHeight + filterHeight - inHeight);\n const
padAlongWidth =\n Math.max(0, (outWidth - 1) * strideWidth + filterWidth - inWidth);\n const top =
Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left =
Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n padInfo = {top, bottom, left, right, type:
'SAME'};\n } else if (pad === 'valid') {\n padInfo = {top: 0, bottom: 0, left: 0, right: 0, type: 'VALID'};\n
outHeight = Math.ceil((inHeight - filterHeight + 1) / strideHeight);\n outWidth = Math.ceil((inWidth - filterWidth
+ 1) / strideWidth);\n } else if (typeof pad === 'object') {\n const top = dataFormat === 'channelsLast' ? pad[1][0]
: pad[2][0];\n const bottom = dataFormat === 'channelsLast' ? pad[1][1] : pad[2][1];\n const left = dataFormat
=== 'channelsLast' ? pad[2][0] : pad[3][0];\n const right = dataFormat === 'channelsLast' ? pad[2][1] :
pad[3][1];\n const padType = (top === 0 && bottom === 0 && left === 0 && right === 0) ?\n 'VALID' :\n 'EXPLICIT';\n padInfo = {top, bottom, left, right, type: padType};\n outHeight = round(\n (inHeight -
filterHeight + top + bottom) / strideHeight + 1,\n roundingMode);\n outWidth = round(\n (inWidth -
filterWidth + left + right) / strideWidth + 1, roundingMode);\n } else {\n throw Error('Unknown padding
parameter: ${pad}');\n } \n\n return {padInfo, outHeight, outWidth};\n}\n\nfunction get3DPadAndOutInfo(\n pad:
'same'|'valid'|number, inDepth: number, inHeight: number,\n inWidth: number, strideDepth: number, strideHeight:
number,\n strideWidth: number, filterDepth: number, filterHeight: number,\n filterWidth: number,
roundingMode?: 'floor'|'round'|'ceil'): {\n padInfo: PadInfo3D,\n outDepth: number,\n outHeight: number,\n
outWidth: number\n } {\n let padInfo: PadInfo3D;\n let outDepth: number;\n let outHeight: number;\n let
outWidth: number;\n\n if (typeof pad === 'number') {\n const padType = (pad === 0) ? 'VALID' : 'NUMBER';\n
padInfo = {\n top: pad,\n bottom: pad,\n left: pad,\n right: pad,\n front: pad,\n back: pad,\n
type: padType\n };\n const outShape = computeOutputShape4D(\n [inDepth, inHeight, inWidth, 1],
filterDepth, 1, strideDepth, pad,\n roundingMode);\n outDepth = outShape[0];\n outHeight = outShape[1];\n
outWidth = outShape[2];\n } else if (pad === 'same') {\n outDepth = Math.ceil(inDepth / strideDepth);\n
outHeight = Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const

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padAlongDepth = (outDepth - 1) * strideDepth + filterDepth - inDepth;\n const padAlongHeight =\n
(outHeight - 1) * strideHeight + filterHeight - inHeight;\n const padAlongWidth = (outWidth - 1) * strideWidth +
filterWidth - inWidth;\n const front = Math.floor(padAlongDepth / 2);\n const back = padAlongDepth - front;\n
const top = Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left =
Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n\n padInfo = {top, bottom, left, right,
front, back, type: 'SAME'};\n } else if (pad === 'valid') {\n padInfo = {\n top: 0,\n bottom: 0,\n left: 0,\n
right: 0,\n front: 0,\n back: 0,\n type: 'VALID'\n };\n outDepth = Math.ceil((inDepth - filterDepth + 1)
/ strideDepth);\n outHeight = Math.ceil((inHeight - filterHeight + 1) / strideHeight);\n outWidth =
Math.ceil((inWidth - filterWidth + 1) / strideWidth);\n } else {\n throw Error(`Unknown padding parameter:
${pad}`);\n }\n return {padInfo, outDepth, outHeight, outWidth};\n}\n\n/**\n * Rounds a value depending on the
rounding mode\n * @param value\n * @param roundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *
provided, it will default to truncate.\n * ^function round(value: number, roundingMode?: 'floor'|'round'|'ceil') {\n if
(!roundingMode) {\n return Math.trunc(value);\n }\n switch (roundingMode) {\n case 'round':\n // used for
Caffe Conv\n return Math.round(value);\n case 'ceil':\n // used for Caffe Pool\n return Math.ceil(value);\n
case 'floor':\n return Math.floor(value);\n default:\n throw new Error(`Unknown roundingMode
${roundingMode}`);\n }\n}\n\nexport function tupleValuesAreOne(param: number|number[]): boolean {\n const
[dimA, dimB, dimC] = parseTupleParam(param);\n return dimA === 1 && dimB === 1 && dimC ===
1;\n}\n\nexport function eitherStridesOrDilationsAreOne(\n strides: number|number[], dilations:
number|number[]): boolean {\n return tupleValuesAreOne(strides) || tupleValuesAreOne(dilations);\n}\n\n/**\n *
Convert Conv2D dataFormat from 'NHWC'|'NCHW' to\n * 'channelsLast'|'channelsFirst'\n * @param dataFormat
in 'NHWC'|'NCHW' mode\n * @return dataFormat in 'channelsLast'|'channelsFirst' mode\n * @throws unknown
dataFormat\n * ^function convertConv2DDataFormat(dataFormat: 'NHWC'|'NCHW'):\n
'channelsLast'|'channelsFirst' {\n if (dataFormat === 'NHWC') {\n return 'channelsLast';\n } else if (dataFormat
=== 'NCHW') {\n return 'channelsFirst';\n } else {\n throw new Error(`Unknown dataFormat
${dataFormat}`);\n }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *
=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {Reshape, ReshapeAttrs, ReshapeInputs} from
'../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport
{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank,
ShapeMap, TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Reshapes a `tf.Tensor` to a
given shape.\n * \n * Given an input tensor, returns a new tensor with the same values as the\n * input tensor with
shape `shape`.\n * \n * If one component of shape is the special value -1, the size of that\n * dimension is computed
so that the total size remains constant. In\n * particular, a shape of [-1] flattens into 1-D. At most one component
of\n * shape can be -1.\n * \n * If shape is 1-D or higher, then the operation returns a tensor with shape\n * shape
filled with the values of tensor. In this case, the number of\n * elements implied by shape must be the same as the
number of elements in\n * tensor.\n * \n * ````js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.reshape([2, 2]).print();\n *
````\n * \n * @param x The input tensor to be reshaped.\n * @param shape An array of integers defining the output
tensor shape.\n * \n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n * ^function reshape<R> extends
Rank>(\n  x: Tensor|TensorLike, shape: ShapeMap[R]): Tensor<R> {\n  const $x = convertToTensor(x, 'x',
'reshape', 'string_or_numeric');\n\n  const inputs: ReshapeInputs = {x: $x};\n  const attrs: ReshapeAttrs = {shape};\n
return ENGINE.runKernel(\n    Reshape, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const reshape = op({reshape_});\n\n"/**\n * @license\n * Copyright 2020 Google

```

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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {cast} from\n './cast';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/**\n * Computes the 2D average pooling of an image.\n * @param x The input tensor, of rank 4\n * or rank 3 of shape\n *   [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: [filterHeight, filterWidth]. If\n *   `filterSize` is a single number, then `filterHeight ==\n *   filterWidth`. \n * @param strides The strides of the pooling: [strideHeight, strideWidth]. If\n *   `strides` is a single number, then `strideHeight == strideWidth`. \n * @param pad The type of padding algorithm:\n *   - `same` and stride 1: output will be of same size as input,\n *     regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *     than 1x1.\n *   - For more info, see this guide:\n *   [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from:\n * 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n *\nfunction avgPool<T extends\n Tensor3D|Tensor4D>(\n  x: T|TensorLike, filterSize: [number, number]|number,\n  strides: [number, number]|number, pad: 'valid'|'same'|number,\n  dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n  const $x =\n    convertToTensor(x, 'x', 'avgPool', 'float32');\n  const dilations = 1;\n  util.assert(\n    conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n    () => `Error in avgPool: Either strides or dilations\n    must be 1. ` +\n    `Got strides ${strides} and dilations '${dilations}'`);\n  let x4D = $x as Tensor4D;\n  let\n    reshapedTo4D = false;\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0],\n    $x.shape[1], $x.shape[2]]);\n  }\n  util.assert(\n    x4D.rank === 4,\n    () => `Error in avgPool: x must be rank 4\n    but got rank ${x4D.rank}.`);\n  if (dimRoundingMode != null) {\n    util.assert(\n      util.isInt(pad as number),\n      () => `Error in avgPool: pad must be an integer when using, ` +\n      `dimRoundingMode\n    ${dimRoundingMode} but got pad ${pad}.`);\n  }\n  const inputs: AvgPoolInputs = {x: x4D};\n  const attrs:\n    AvgPoolAttrs = {filterSize, strides, pad, dimRoundingMode};\n  // tslint:disable-next-line: no-unnecessary-type-\n  assertion\n  let res = ENGINE.runKernel(\n    AvgPool, inputs as {} as NamedTensorMap,\n    attrs\n    as {} as NamedAttrMap) as T;\n  res = cast(res, $x.dtype);\n  if (reshapedTo4D) {\n    return reshape(res,\n    [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  }\n  return res;\n}\n\nexport const avgPool =\n  op({avgPool_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under\n * the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {cast} from\n './cast';
```



```

2], [10, 20]);\n * const b = tf.tensor2d([[3, 4], [30, 40]]);\n * const axis = 1;\n * tf.concat([a, b], axis).print();\n *
```\n * @param tensors A list of tensors to concatenate.\n * @param axis The axis to concatenate along. Defaults to 0
(the first dim).\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n * \nfunction concat_<T
extends Tensor>(tensors: Array<T|TensorLike>, axis = 0): T {\n assert(tensors.length >= 1, () => 'Pass at least one
tensor to concat');\n const $tensors =\n convertToTensorArray(tensors, 'tensors', 'concat',
'string_or_numeric');\n if ($tensors[0].dtype === 'complex64') {\n $tensors.forEach(tensor => {\n if
(tensor.dtype !== 'complex64') {\n throw new Error('Cannot concatenate complex64 tensors with a tensor\n
with dtype ${tensor.dtype}.');\n }\n });\n }\n if ($tensors.length === 1) {\n return clone($tensors[0]);\n }\n const inputs: ConcatInputs = $tensors;\n const attr: ConcatAttrs = {axis};\n return ENGINE.runKernel(\n
Concat, inputs as {} as NamedTensorMap, attr as {} as NamedAttrMap);\n}\n\nexport const concat =
op({concat_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Sigmoid, SigmoidInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
sigmoid element-wise, $1 / (1 + \exp(-x))$ \n * \n * \n * const x = tf.tensor1d([0, -1, 2, -3]);\n * \n *
x.sigmoid().print(); // or tf.sigmoid(x)\n * \n * @param x The input tensor.\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n * \nfunction sigmoid_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sigmoid');\n const inputs: SigmoidInputs = {x: $x};\n return
ENGINE.runKernel(Sigmoid, inputs as {} as NamedTensorMap);\n}\n\nexport const sigmoid =
op({sigmoid_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Slice, SliceAttrs, SliceInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank, TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a slice from a `tf.Tensor` starting at coordinates
`begin`\n * and is of size `size`.\n * \n * Also available are stricter rank-specific methods with the same signature\n *
as this method that assert that `x` is of the given rank:\n * - `tf.slice1d`\n * - `tf.slice2d`\n * - `tf.slice3d`\n * -
`tf.slice4d`\n * \n * \n * const x = tf.tensor1d([1, 2, 3, 4]);\n * \n * x.slice([1], [2]).print();\n * \n * \n * \n *
const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * \n * x.slice([1, 0], [1, 2]).print();\n * \n * \n * @param x The input
`tf.Tensor` to slice from.\n * @param begin The coordinates to start the slice from. The length can be\n * less
than the rank of x - the rest of the axes will have implicit 0 as\n * start. Can also be a single number, in which case
it specifies the\n * first axis.\n * @param size The size of the slice. The length can be less than the rank of\n * x
- the rest of the axes will have implicit -1. A value of -1 requests\n * the rest of the dimensions in the axis. Can
also be a single number,\n * in which case it specifies the size of the first axis.\n * \n * @doc {heading: 'Tensors',
subheading: 'Slicing and Joining'}\n * \nfunction slice_<R extends Rank, T extends Tensor<R>>(\n x:

```

```
T|TensorLike, begin: number|number[], size?: number|number[]): T {\n const $x = convertToTensor(x, 'x', 'slice', 'string_or_numeric');\n if ($x.rank === 0) {\n throw new Error('Slicing scalar is not possible');\n }\n const inputs: SliceInputs = {x: $x};\n const attrs: SliceAttrs = {begin, size};\n return ENGINE.runKernel(\n Slice, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const slice = op({slice_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport {ENGINE} from './engine';\nimport {Tanh, TanhInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/*\n * Computes hyperbolic tangent of the input `tf.Tensor` element-wise: `tanh(x)`\n * const x = tf.tensor1d([0, 1, -1, 70]);\n * x.tanh().print(); // or tf.tanh(x)\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction tanh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'tanh');\n const inputs: TanhInputs = {x: $x};\n return ENGINE.runKernel(Tanh, inputs as {} as NamedTensorMap);\n}\n\nexport const tanh = op({tanh_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n\nimport {Scalar, Tensor1D, Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {add} from './add';\nimport {concat} from './concat';\nimport {matMul} from './mat_mul';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport {slice} from './slice';\nimport {tanh} from './tanh';\n\n/*\n * Computes the next state and output of a BasicLSTMCell.\n * Returns `[newC, newH]`.\n * Derived from tf.contrib.rnn.BasicLSTMCell.\n * @param forgetBias Forget bias for the cell.\n * @param lstmKernel The weights for the cell.\n * @param lstmBias The bias for the cell.\n * @param data The input to the cell.\n * @param c Previous cell state.\n * @param h Previous cell output.\n * @doc {heading: 'Operations', subheading: 'RNN'}\n */\nfunction basicLSTMCell_(\n forgetBias: Scalar|TensorLike, lstmKernel: Tensor2D|TensorLike,\n lstmBias: Tensor1D|TensorLike, data: Tensor2D|TensorLike,\n c: Tensor2D|TensorLike, h: Tensor2D|TensorLike): [Tensor2D, Tensor2D] {\n const $forgetBias =\n convertToTensor(forgetBias, 'forgetBias', 'basicLSTMCell');\n const $lstmKernel =\n convertToTensor(lstmKernel, 'lstmKernel', 'basicLSTMCell');\n const $lstmBias =\n convertToTensor(lstmBias, 'lstmBias', 'basicLSTMCell');\n const $data =\n convertToTensor(data, 'data', 'basicLSTMCell');\n const $c =\n convertToTensor(c, 'c', 'basicLSTMCell');\n const $h =\n convertToTensor(h, 'h', 'basicLSTMCell');\n const combined = concat([$data, $h], 1);\n const weighted =\n matMul(combined, $lstmKernel);\n const res: Tensor2D = add(weighted, $lstmBias);\n // i = input_gate, j = new_input, f = forget_gate, o = output_gate\n const batchSize = res.shape[0];\n const sliceCols = res.shape[1] / 4;\n const sliceSize: [number, number] = [batchSize, sliceCols];\n const i = slice(res, [0, 0], sliceSize);\n const j = slice(res, [0, sliceCols], sliceSize);\n const f = slice(res, [0, sliceCols * 2], sliceSize);\n const o = slice(res, [0, sliceCols * 3], sliceSize);\n const newC: Tensor2D =\n add(mul(sigmoid(i), tanh(j)),\n mul($c, sigmoid(add($forgetBias, f)) as Tensor2D));\n const newH: Tensor2D =\n mul(tanh(newC), sigmoid(o));\n return [newC, newH];\n}\n\nexport const basicLSTMCell = op({basicLSTMCell_});\n", "/*\n * @license\n * Copyright
```

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```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {BatchToSpaceND, BatchToSpaceNDAttrs,\nBatchToSpaceNDInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\n\n/**\n * This operation reshapes the \"batch\" dimension 0 into `M + 1` dimensions of\n * shape `blockShape + [batch]`, interleaves these blocks back into the grid\n * defined by the spatial dimensions `[1, ..., M]`, to obtain a result with\n * the same rank as the input. The spatial dimensions of this intermediate\n * result are then optionally cropped according to `crops` to produce the\n * output. This is the reverse of `tf.spaceToBatchND`. See below for a precise\n * description.\n *\n * ```js\n * const x = tf.tensor4d([1, 2, 3, 4], [4, 1, 1, 1]);\n * const\n * blockShape = [2, 2];\n * const crops = [[0, 0], [0, 0]];\n *\n * x.batchToSpaceND(blockShape, crops).print();\n *\n * ```\n *\n * @param x A `tf.Tensor` N-D with `x.shape` = `[batch] + spatialShape`,\n * where `spatialShape` has `M` dimensions.\n *\n * @param blockShape A 1-D array. Must have shape `[M]`, all values must\n * be ≥ 1 .\n *\n * @param crops A 2-D array. Must have shape `[M, 2]`, all values must be ≥ 0 .\n * `crops[i] = [cropStart, cropEnd]` specifies the amount to crop from input\n * dimension `i + 1`, which corresponds to spatial dimension `i`. It is required\n * that `cropStart[i] + cropEnd[i] <= blockShape[i] * inputShape[i + 1]`.\n *\n * This operation is equivalent to the following steps:\n *\n * 1. Reshape `x` to `reshaped` of shape: `[blockShape[0], ..., \n * blockShape[M-1], batch / prod(blockShape), x.shape[1], ..., \n * x.shape[N-1]]`\n *\n * 2. Permute dimensions of `reshaped` to produce `permuted` of shape\n * `[batch /\n * prod(blockShape), x.shape[1], blockShape[0], ..., \n * x.shape[M], \n * blockShape[M-1], x.shape[M+1], ..., \n * x.shape[N-1]]`\n *\n * 3. Reshape `permuted` to produce `reshapedPermuted` of shape\n * `[batch /\n * prod(blockShape), x.shape[1] * blockShape[0], ..., \n * x.shape[M] * \n * blockShape[M-1], x.shape[M+1], ..., \n * x.shape[N-1]]`\n *\n * 4. Crop the start and end of dimensions `[1, ..., M]` of\n * `reshapedPermuted` according to `crops` to produce the output of shape:\n * `[batch /\n * prod(blockShape), x.shape[1] * blockShape[0] - crops[0,0] - crops[0,1], \n * ..., \n * x.shape[M] * blockShape[M-1] - \n * crops[M-1,0] - \n * crops[M-1,1], x.shape[M+1], ..., \n * x.shape[N-1]]`\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction batchToSpaceND<T extends Tensor>(\n x: T | TensorLike, blockShape:\n number[], crops: number[][]): T {\n const $x = convertToTensor(x, 'x', 'batchToSpaceND');\n const prod =\n blockShape.reduce((a, b) => a * b);\n util.assert(\n $x.rank >= 1 + blockShape.length,\n () => `input rank is ${$x.rank} but should be > than\n blockShape.length ${\n blockShape.length}`);\n util.assert(\n crops.length === blockShape.length,\n () => `crops.length is ${\n crops.length} but should be equal to\n blockShape.length ${\n blockShape.length}`);\n util.assert(\n $x.shape[0] % prod === 0,\n () => `input tensor batch is ${\n $x.shape[0]} but is not divisible by the product of ` +\n `the elements of\n blockShape ${blockShape.join(' ')} === ${prod}`);\n const inputs: BatchToSpaceNDInputs = {x: $x};\n const\n attrs: BatchToSpaceNDAttrs = {blockShape, crops};\n return ENGINE.runKernel(\n BatchToSpaceND, inputs\n) as NamedTensorMap,\n attrs as { } as NamedAttrMap);\n}\n\nexport const batchToSpaceND =\n op({batchToSpaceND_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */
```

```

=====
*\nimport {Tensor, Tensor4D} from './tensor';\nimport {Rank} from './types';\nimport {reshape} from
'./reshape';\n\nexport function xAs4D<R extends Rank>(x: Tensor<R>) {\n let x4D: Tensor4D;\n if (x.rank === 0
|| x.rank === 1) {\n x4D = reshape(x, [1, 1, 1, x.size]);\n } else if (x.rank === 2) {\n x4D = reshape(x, [1, 1,
x.shape[0], x.shape[1]]);\n } else if (x.rank === 3) {\n x4D = reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n
} else {\n x4D = x as Tensor4D;\n }\n return x4D;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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```

=====
*\n\nimport {ENGINE} from './engine';\nimport {FusedBatchNorm, FusedBatchNormAttrs,
FusedBatchNormInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport
{Tensor, Tensor1D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport
{convertToTensor} from './tensor_util_env';\nimport {Rank, TensorLike} from './types';\nimport * as util from
'./util';\n\nimport {xAs4D} from './batchnorm_util';\nimport {op} from './operation';\nimport {reshape} from
'./reshape';\n\n/**\n * Batch normalization.\n * As described in\n *
http://arxiv.org/abs/1502.03167.\n * Mean, variance, scale, and offset can be
of two shapes:\n * - The same shape as the input.\n * - In the common case, the depth dimension is the last
dimension of x, so\n * the values would be an `tf.Tensor1D` of shape [depth].\n * Also available are stricter
rank-specific methods with the same signature\n * as this method that assert that parameters passed are of given
rank\n * - `tf.batchNorm2d`\n * - `tf.batchNorm3d`\n * - `tf.batchNorm4d`\n * @param x The input
Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance Tensor.\n * @param offset An offset
Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by
0.\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n\nfunction batchNorm_<R extends
Rank>(\n x: Tensor<R>|TensorLike, mean: Tensor<R>|Tensor1D|TensorLike,\n variance:
Tensor<R>|Tensor1D|TensorLike,\n offset?: Tensor<R>|Tensor1D|TensorLike,\n scale?:
Tensor<R>|Tensor1D|TensorLike,\n varianceEpsilon?: number): Tensor<R> {\n if (varianceEpsilon == null) {\n
varianceEpsilon = 0.001;\n }\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean =
convertToTensor(mean, 'mean', 'batchNorm');\n const $variance = convertToTensor(variance, 'variance',
'batchNorm');\n let $scale: Tensor<R>|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale',
'batchNorm');\n }\n let $offset: Tensor<R>|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset,
'offset', 'batchNorm');\n }\n util.assert(\n $mean.rank === $variance.rank,\n () => 'Batch normalization
gradient requires mean and variance to have ' +\n 'equal ranks.);\n util.assert(\n $offset == null ||
$mean.rank === $offset.rank,\n () => 'Batch normalization gradient requires mean and offset to have ' +\n 'equal ranks.);\n util.assert(\n $scale == null || $mean.rank === $scale.rank,\n () => 'Batch normalization
gradient requires mean and scale to have ' +\n 'equal ranks.);\n const x4D: Tensor4D = xAs4D($x);\n const
inputs: FusedBatchNormInputs = {\n x: x4D,\n scale: $scale,\n offset: $offset,\n mean: $mean,\n
variance: $variance\n };\n const attrs: FusedBatchNormAttrs = {varianceEpsilon};\n // tslint:disable-next-line:
no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n FusedBatchNorm, inputs as {\n as
NamedTensorMap,\n attrs as {\n as NamedAttrMap\n } as Tensor<R>;\n }\n return reshape(res,
$x.shape);\n}\n\nexport const batchNorm = op({batchNorm_});\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES

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```
=====
* \nimport {Tensor1D, Tensor2D} from './tensor'; \nimport {convertToTensor} from './tensor_util_env'; \nimport
{TensorLike} from './types'; \nimport * as util from './util'; \nimport {batchNorm} from './batchnorm'; \nimport
{op} from './operation'; \n\n** \n * Batch normalization, strictly for 2D. For the more relaxed version, see \n *
`tf.batchNorm`. \n * \n * @param x The input Tensor. \n * @param mean A mean Tensor. \n * @param variance A
variance Tensor. \n * @param offset An offset Tensor. \n * @param scale A scale Tensor. \n * @param
varianceEpsilon A small float number to avoid dividing by 0. \n *\nfunction batchNorm2d_(\n x:
Tensor2D|TensorLike, mean: Tensor2D|Tensor1D|TensorLike, \n variance: Tensor2D|Tensor1D|TensorLike, \n offset?: Tensor2D|Tensor1D|TensorLike, scale?: Tensor2D|Tensor1D|TensorLike, \n varianceEpsilon?: number):
Tensor2D { \n const $x = convertToTensor(x, 'x', 'batchNorm'); \n const $mean = convertToTensor(mean, 'mean',
'batchNorm'); \n const $variance = convertToTensor(variance, 'variance', 'batchNorm'); \n let $scale:
Tensor2D|Tensor1D; \n if (scale != null) { \n $scale = convertToTensor(scale, 'scale', 'batchNorm'); \n } \n let
$offset: Tensor2D|Tensor1D; \n if (offset != null) { \n $offset = convertToTensor(offset, 'offset', 'batchNorm'); \n } \n util.assert(\n $x.rank === 2, \n () => `Error in batchNorm2D: x must be rank 2 but got rank ` + \n `${$x.rank}`); \n util.assert(\n $mean.rank === 2 || $mean.rank === 1, \n () => `Error in batchNorm2D: mean
must be rank 2 or rank 1 but ` + \n `got rank ${$mean.rank}`); \n util.assert(\n $variance.rank === 2 ||
$variance.rank === 1, \n () => `Error in batchNorm2D: variance must be rank 2 or rank 1 ` + \n `but got rank
${$variance.rank}`); \n if ($scale != null) { \n util.assert(\n $scale.rank === 2 || $scale.rank === 1, \n () =>
`Error in batchNorm2D: scale must be rank 2 or rank 1 ` + \n `but got rank ${$scale.rank}`); \n } \n if ($offset
!= null) { \n util.assert(\n $offset.rank === 2 || $offset.rank === 1, \n () => `Error in batchNorm2D: offset
must be rank 2 or rank 1 ` + \n `but got rank ${$offset.rank}`); \n } \n \n return batchNorm($x, $mean,
$variance, $offset, $scale, varianceEpsilon); \n} \n\nexport const batchNorm2d = op({batchNorm2d_}); \n\n", /** \n *
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2.0 (the "License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a
copy of the License at \n * http://www.apache.org/licenses/LICENSE-2.0 \n * Unless required by applicable
law or agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
=====
* \nimport {Tensor1D, Tensor3D} from './tensor'; \nimport {convertToTensor} from './tensor_util_env'; \nimport
{TensorLike} from './types'; \nimport * as util from './util'; \nimport {batchNorm} from './batchnorm'; \nimport
{op} from './operation'; \n\n** \n * Batch normalization, strictly for 3D. For the more relaxed version, see \n *
`tf.batchNorm`. \n * \n * @param x The input Tensor. \n * @param mean A mean Tensor. \n * @param variance A
variance Tensor. \n * @param offset An offset Tensor. \n * @param scale A scale Tensor. \n * @param
varianceEpsilon A small float number to avoid dividing by 0. \n *\nfunction batchNorm3d_(\n x:
Tensor3D|TensorLike, mean: Tensor3D|Tensor1D|TensorLike, \n variance: Tensor3D|Tensor1D|TensorLike, \n offset?: Tensor3D|Tensor1D|TensorLike, scale?: Tensor3D|Tensor1D|TensorLike, \n varianceEpsilon?: number):
Tensor3D { \n const $x = convertToTensor(x, 'x', 'batchNorm'); \n const $mean = convertToTensor(mean, 'mean',
'batchNorm'); \n const $variance = convertToTensor(variance, 'variance', 'batchNorm'); \n let $scale:
Tensor3D|Tensor1D; \n if (scale != null) { \n $scale = convertToTensor(scale, 'scale', 'batchNorm'); \n } \n let
$offset: Tensor3D|Tensor1D; \n if (offset != null) { \n $offset = convertToTensor(offset, 'offset', 'batchNorm'); \n } \n util.assert(\n $x.rank === 3, \n () => `Error in batchNorm3D: x must be rank 3 but got rank ` + \n `${$x.rank}`); \n util.assert(\n $mean.rank === 3 || $mean.rank === 1, \n () => `Error in batchNorm3D: mean
must be rank 3 or rank 1 but ` + \n `got rank ${$mean.rank}`); \n util.assert(\n $variance.rank === 3 ||
$variance.rank === 1, \n () => `Error in batchNorm3D: variance must be rank 3 or rank 1 ` + \n `but got rank
${$variance.rank}`); \n if ($scale != null) { \n util.assert(\n $scale.rank === 3 || $scale.rank === 1, \n () =>
`Error in batchNorm3D: scale must be rank 3 or rank 1 ` + \n `but got rank ${$scale.rank}`); \n } \n if ($offset
!= null) { \n util.assert(\n $offset.rank === 3 || $offset.rank === 1, \n () => `Error in batchNorm3D: offset
must be rank 3 or rank 1 ` + \n `but got rank ${$offset.rank}`); \n } \n \n return batchNorm($x, $mean,
$variance, $offset, $scale, varianceEpsilon); \n} \n\nexport const batchNorm3d = op({batchNorm3d_}); \n\n", /** \n *
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2.0 (the "License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a
copy of the License at \n * http://www.apache.org/licenses/LICENSE-2.0 \n * Unless required by applicable
law or agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
=====
```

```

`Error in batchNorm3D: scale must be rank 3 or rank 1 ` +\n `but got rank ${$scale.rank}.`);\n } \n if ($offset
!= null) {\n util.assert(\n $offset.rank === 3 || $offset.rank === 1,\n () => `Error in batchNorm3D: offset
must be rank 3 or rank 1 ` +\n `but got rank ${$offset.rank}.`);\n } \n\n return batchNorm($x, $mean,
$,variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm3d = op({ batchNorm3d_});\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\nimport {Tensor1D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\nimport {batchNorm} from './batchnorm';\nimport
{op} from './operation';\n\n/**\n * Batch normalization, strictly for 4D. For the more relaxed version, see\n *
`tf.batchNorm`.\n * \n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A
variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param
varianceEpsilon A small float number to avoid dividing by 0.\n */\nfunction batchNorm4d_(\n x:\n Tensor4D|TensorLike, mean: Tensor4D|Tensor1D|TensorLike,\n variance: Tensor4D|Tensor1D|TensorLike,\n offset?: Tensor4D|Tensor1D|TensorLike, scale?: Tensor4D|Tensor1D|TensorLike,\n varianceEpsilon?: number):\n Tensor4D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean',
'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale:\n Tensor4D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let
$offset: Tensor4D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n
}\n util.assert(\n $x.rank === 4,\n () => `Error in batchNorm4D: x must be rank 4 but got rank ` +\n
`${$x.rank}.`);\n util.assert(\n $mean.rank === 4 || $mean.rank === 1,\n () => `Error in batchNorm4D: mean
must be rank 4 or rank 1 but ` +\n `got rank ${$mean.rank}.`);\n util.assert(\n $variance.rank === 4 ||
$,variance.rank === 1,\n () => `Error in batchNorm4D: variance must be rank 4 or rank 1 ` +\n `but got rank
${$variance.rank}.`);\n if ($scale != null) {\n util.assert(\n $scale.rank === 4 || $scale.rank === 1,\n () =>
`Error in batchNorm4D: scale must be rank 4 or rank 1 ` +\n `but got rank ${$scale.rank}.`);\n } \n if ($offset
!= null) {\n util.assert(\n $offset.rank === 4 || $offset.rank === 1,\n () => `Error in batchNorm4D: offset
must be rank 4 or rank 1 ` +\n `but got rank ${$offset.rank}.`);\n } \n\n return batchNorm($x, $mean,
$,variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm4d = op({ batchNorm4d_});\n"/**\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {ENGINE} from './engine';\nimport {Bincount, BincountAttrs, BincountInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor1D} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\n\n/**\n * Outputs a
vector with length `size` and the same dtype as `weights`.\n * \n * If `weights` are empty, then index `i` stores the
number of times the value\n * `i` is counted in `x`. If `weights` are non-empty, then index `i` stores the\n * sum of
the value in `weights` at each index where the corresponding value in\n * `x` is `i`.\n * \n * Values in `x` outside of
the range [0, size) are ignored.\n * \n * @param x The input int tensor, rank 1.\n * @param weights The weights
tensor, must have the same shape as x, or a\n * length-0 Tensor, in which case it acts as all weights equal to 1.\n *

```

```

@param size Non-negative integer.\n * \n * @doc {heading: 'Operations', subheading: 'Reduction'}\n *\nfunction
bincount_<T extends Tensor1D>(\n x: T|TensorLike, weights: T|TensorLike, size: number): T {\n const $x =
convertToTensor(x, 'x', 'bincount');\n const $weights = convertToTensor(weights, 'weights', 'bincount');\n\n
util.assert(\n $x.dtype === 'int32',\n () => `Error in bincount: input ` +\n `dtype must be int32, but got
${$x.dtype}`);\n util.assert(size >= 0, () => `size must be non-negative, but got ${size}.`);\n util.assert(\n
$weights.size === $x.size || $weights.size === 0,\n () => `Error in bincount: weights must have the same size as
input or ` +\n `0-length, but got input shape: ${$x.shape}, weights shape: ` +\n `${$weights.shape}.`);\n\n
const inputs: BincountInputs = {x: $x, weights: $weights};\n const attrs: BincountAttrs = {size};\n\n return
ENGINE.runKernel(\n Bincount, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport
const bincount = op({bincount_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {ENGINE} from '../engine';\nimport {Tile, TileAttrs, TileInputs} from '../kernel_names';\nimport
{NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
 '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, ShapeMap, TensorLike}
from '../types';\nimport {clone} from './clone';\nimport {op} from './operation';\nimport {reshape} from
 './reshape';\n\n/**\n * Broadcast an array to a compatible shape NumPy-style.\n *\n * The tensor's shape
is compared to the broadcast shape from end to beginning.\n *\n * Ones are prepended to the tensor's shape until
it has the same length as\n *\n * the broadcast shape. If input.shape[i]==shape[i], the (i+1)-th axis is\n *\n
* already broadcast-compatible. If input.shape[i]==1 and shape[i]==N, then\n *\n * the input tensor is tiled
N times along that axis (using tf.tile).\n *\n * @param input The tensor that is to be broadcasted.\n *
@param shape The input is to be broadcast to this shape.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n *\nfunction broadcastTo_<R
extends Rank>(\n x: Tensor|TensorLike, shape: ShapeMap[R]): Tensor<R> {\n let input = convertToTensor(x,
'broadcastTo', 'x');\n const xShape = input.shape;\n\n if (shape.some(d => !(d > 0) || d % 1 !== 0)) {\n
 throw new Error(`broadcastTo(): Invalid broadcast shape [${shape}].`);\n }\n\n if (shape.length < input.rank) {\n
 throw new Error(`broadcastTo(): shape.length=${shape.length} < input.rank=${\n input.rank}.`);\n }\n\n
 if (shape.length > input.rank) {\n const newShape = input.shape.slice();\n while (newShape.length < shape.length) {\n
 newShape.unshift(1);\n }\n input = reshape(input, newShape);\n }\n\n const inputShape = input.shape;\n const
reps: number[] = Array.from(shape);\n for (let i = shape.length - 1; i >= 0; i--) {\n if (inputShape[i] ===
shape[i]) {\n reps[i] = 1;\n } else if (input.shape[i] !== 1) {\n throw new Error(\n `broadcastTo():
[${xShape}] cannot be broadcast to [${shape}].`);\n }\n }\n const axes = reps.map((n, i) => n > 1 ? i : -1).filter(i => i >=
0);\n\n if (axes.length === 0) {\n return clone(input) as Tensor<R>;\n }\n\n // TODO call broadcastTo kernel
directly once backends implement broadcastTo\n const inputs: TileInputs = {x: input};\n const attrs: TileAttrs =
{reps};\n return ENGINE.runKernel(\n Tile, inputs as {} as NamedTensorMap, attrs as unknown as
NamedAttrMap);\n}\n\nexport const broadcastTo = op({broadcastTo_});\n", "/*\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {ENGINE} from '../engine';\nimport {Ceil, CeilInputs} from '../kernel_names';\nimport {Tensor} from

```



```

*\nimport {Tensor2D} from './tensor';\nimport {TensorLike} from './types';\n\nimport {concat} from
 './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of tf.Tensor2D`s along an axis. See
 `concat` for details.\n *\n * For example, if:\n * A: shape(2, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * B:
 shape(2, 3) = | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * C = tf.concat2d([A, B], axis)\n *\n * if axis = 0:\n * C:
 shape(4, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * if
 axis = 1:\n * C = shape(2, 6) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n * @param
 tensors A list of `tf.Tensor`s to concatenate.\n * @param axis The axis to concatenate along.\n * @return The
 concatenated array.\n */\nfunction concat2d_(\n tensors: Array<Tensor2D|TensorLike>, axis: number): Tensor2D
 {\n return concat(tensors, axis);\n}\n\nexport const concat2d = op({concat2d_});\n\n"/**\n * @license\n *
 Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
 `License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
 License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
 agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\nimport {Tensor3D} from './tensor';\nimport {TensorLike} from './types';\n\nimport {concat} from
 './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor3D`s along an axis.\n * See
 `concat` for details.\n *\n * For example, if:\n * A: shape(2, 1, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n *\n * B:
 shape(2, 1, 3) = | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * C = tf.concat3d([A, B], axis)\n *\n * if axis =
 0:\n * C: shape(4, 1, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * | r3, g3, b3 |\n * | r4,
 g4, b4 |\n *\n * if axis = 1:\n * C: shape(2, 2, 3) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n
 *\n * if axis = 2:\n * C = shape(2, 1, 6) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n *
 @param tensors A list of tf.Tensor`s to concatenate.\n * @param axis The axis to concate along.\n * @return The
 concatenated array.\n */\nfunction concat3d_(\n tensors: Array<Tensor3D|TensorLike>, axis: number): Tensor3D
 {\n return concat(tensors, axis);\n}\n\nexport const concat3d = op({concat3d_});\n\n"/**\n * @license\n *
 Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
 `License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
 License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
 agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\nimport {Tensor4D} from './tensor';\nimport {TensorLike} from './types';\n\nimport {concat} from
 './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor4D`s along an axis.\n * See
 `concat` for details.\n *\n * @param tensors A list of `tf.Tensor`s to concatenate.\n * @param axis The axis to
 concate along.\n * @return The concatenated array.\n */\nfunction concat4d_(\n tensors:
 Array<Tensor4D|TensorLike>, axis: number): Tensor4D {\n return concat(tensors, axis);\n}\n\nexport const
 concat4d = op({concat4d_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
 Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file except in
 compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {Conv2D, Conv2DAttrs, Conv2DInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from

```



rank 2, of shape `[batch, width, inChannels]`. If rank 2, batch of 1 is assumed.  
 rank 3, of shape `[filterWidth, inDepth, outDepth]`.  
 @param filter The filter, rank 3, of shape `[filterWidth, inDepth, outDepth]`.  
 @param stride The number of entries by which the filter is moved right at each step.  
 @param pad The type of padding algorithm. - `same` and stride 1: output will be of same size as input, regardless of filter size. - `valid`: output will be smaller than input if filter is larger than 1x1.  
 - For more info, see this guide:

[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution)

[https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution)  
 @param dataFormat An optional string from `"NWC"`, `"NCW"`. Defaults to `"NWC"`, the data is stored in the order of `[batch, in_width, in_channels]`. Only `"NWC"` is currently supported.  
 @param dilation The dilation rate in which we sample input values in atrous convolution. Defaults to `1`. If it is greater than 1, then stride must be `1`.  
 @param dimRoundingMode A string from: `'ceil'`, `'round'`, `'floor'`. If none is provided, it will default to truncate.

```
@doc {heading: 'Operations', subheading: 'Convolution'}
def conv1d<T extends Tensor2D|Tensor3D>(
 x: T|TensorLike, filter: Tensor3D|TensorLike, stride: number,
 pad: 'valid'|'same'|number|conv_util.ExplicitPadding,
 dataFormat: 'NWC'|'NCW' = 'NWC', dilation = 1,
 dimRoundingMode?: 'floor'|'round'|'ceil'): T {
 const $x = convertToTensor(x, 'x', 'conv1d');
 const $filter = convertToTensor(filter, 'filter', 'conv1d');
 let x3D = $x as Tensor3D;
 let reshapedTo3D = false;
 if ($x.rank === 2) {
 reshapedTo3D = true;
 x3D = reshape($x, [1, $x.shape[0], $x.shape[1]]);
 }
 util.assert(x3D.rank === 3, () => `Error in conv1d: input must be rank 3, but got rank ${x3D.rank}.`);
 util.assert($filter.rank === 3, () => `Error in conv1d: filter must be rank 3, but got rank ` + $filter.rank + `.`);
 if (dimRoundingMode != null) {
 util.assert(util.isInt(pad as number), () => `Error in conv1d: pad must be an integer when using, ` + dimRoundingMode + ` but got pad ${pad}.`);
 }
 util.assert(x3D.shape[2] === $filter.shape[1], () => `Error in conv1d: depth of input (${x3D.shape[2]}) must match ` + input depth for filter (${filter.shape[1]}.`);
 util.assert(conv_util.eitherStridesOrDilationsAreOne(stride, dilation), () => `Error in conv1D: Either stride or dilation must be 1.` + `Got stride ${stride} and dilation '${dilation}'`);
 util.assert(dataFormat === 'NWC', () => `Error in conv1d: got dataFormat of ${dataFormat} but only NWC is currently supported.`);
 const filter4D = reshape($filter, [1, $filter.shape[0], $filter.shape[1], $filter.shape[2]]);
 const input4D = reshape(x3D, [x3D.shape[0], 1, x3D.shape[1], x3D.shape[2]]);
 const strides: [number, number] = [1, stride];
 const dilations: [number, number] = [1, dilation];
 const conv2dDataFormat = 'NHWC';
 const res = conv2d(input4D as Tensor4D, (filter4D as Tensor4D), strides, pad, conv2dDataFormat, dilations, dimRoundingMode);
 if (reshapedTo3D) {
 return reshape(res, [res.shape[2], res.shape[3]]) as T;
 }
 return reshape(res, [res.shape[0], res.shape[2], res.shape[3]]) as T;
}
export const conv1d = op({conv1d_});
/**
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
```

```
=====
import {ENGINE} from '../engine';
import {Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs} from '../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor3D, Tensor4D} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import * as util from '../util';
import * as conv_util from './conv_util';
import {op} from './operation';
import {reshape} from './reshape';
/**
 * Computes the derivative of the input of a 2D convolution.
 * @param xShape The shape of the input: [batch, height, width, inDepth].
 * If length of 3, batch of 1 is assumed.
 * @param dy The derivative of the output, of rank 4 or rank 3 of shape [batch, outHeight, outWidth, outDepth].
 * If rank 3, batch of 1 is assumed.
 * @param filter The filter, rank 4, of shape [filterHeight, filterWidth, inDepth, outDepth].
 */
```

```

@param strides The strides of the convolution: `[strideHeight, \n * strideWidth]`. \n * @param pad The type of
padding algorithm used: \n * - `same` and stride 1: output will be of same size as input, \n * regardless of filter
size. \n * - `valid`: output will be smaller than input if filter is larger \n * than 1x1. \n * @param dataFormat: An
optional string from: `"NHWC"`, `"NCHW"`. Defaults to \n * `"NHWC"`. Specify the data format of the input and
output data. With the \n * default format `"NHWC"`, the data is stored in the order of: [batch, \n * height, width,
channels]. \n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is \n * provided, it will
default to truncate. \n */
function conv2DBackpropInput_<T extends Tensor3D|Tensor4D>(\n xShape: [number,
number, number, number][number, number, number], dy: T, \n filter: Tensor4D, strides: [number,
number][number, \n pad: 'valid'|'same'|number|conv_util.ExplicitPadding, \n dataFormat: 'NHWC'|'NCHW' =
'NHWC', \n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n util.assert(\n xShape.length === dy.rank, \n ()
=> `Length of inShape ` + \n `(${xShape.length}) and rank of dy (${dy.rank}) must match`); \n \n let xShape4D
= xShape as [number, number, number, number]; \n let dy4D = dy as Tensor4D; \n let reshapedTo4D = false; \n if
(dy.rank === 3) {\n reshapedTo4D = true; \n dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]); \n
xShape4D = [1, xShape[0], xShape[1], xShape[2]]; \n } \n \n util.assert(\n xShape4D.length === 4, \n () => \n
`Error in conv2dDerInput: inShape must be length 4, but got length ` + \n ` ${xShape4D.length}. `); \n
util.assert(\n dy4D.rank === 4, \n () => `Error in conv2dDerInput: dy must be rank 4, but got ` + \n `rank
${dy4D.rank}`); \n util.assert(\n filter.rank === 4, \n () => `Error in conv2dDerInput: filter must be rank 4, but
got ` + \n `rank ${filter.rank}`); \n const inDepth = dataFormat === 'NHWC' ? xShape4D[3] : xShape4D[1]; \n
const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] : dy4D.shape[1]; \n util.assert(\n inDepth ===
filter.shape[2], \n () => `Error in conv2dDerInput: depth of input (${inDepth}) must ` + \n `match input
depth for filter ${filter.shape[2]}. `); \n util.assert(\n outDepth === filter.shape[3], \n () => `Error in
conv2dDerInput: depth of output (${outDepth}) must ` + \n `match output depth for filter
${filter.shape[3]}. `); \n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number), \n () =>
`Error in conv2dDerInput: pad must be an integer when using, ` + \n `dimRoundingMode
${dimRoundingMode} but got pad ${pad}. `); \n } \n \n const inputs: Conv2DBackpropInputInputs = {dy: dy4D,
filter}; \n \n const attrs: Conv2DBackpropInputAttrs = \n {strides, pad, dataFormat, dimRoundingMode,
inputShape: xShape4D}; \n \n // tslint:disable-next-line: no-unnecessary-type-assertion \n const res =
ENGINE.runKernel(\n Conv2DBackpropInput, inputs as {} as NamedTensorMap, \n attrs as {}
as NamedAttrMap) as T; \n \n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]])
as T; \n } \n return res; \n } \n \n export const conv2DBackpropInput = op({conv2DBackpropInput_}); \n /** \n *
@license \n * Copyright 2020 Google LLC. All Rights Reserved. \n * Licensed under the Apache License, Version
2.0 (the "License"); \n * you may not use this file except in compliance with the License. \n * You may obtain a
copy of the License at \n * \n * http://www.apache.org/licenses/LICENSE-2.0 \n * \n * Unless required by applicable
law or agreed to in writing, software \n * distributed under the License is distributed on an "AS IS" BASIS, \n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. \n * See the License for
the specific language governing permissions and \n * limitations under the License. \n *
===== \n
*/
import {Tensor3D, Tensor4D} from './tensor';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {conv2DBackpropInput} from './conv2d_backprop_input';
import {op} from './operation';
/**
 * Computes the transposed 2D convolution of an image, also known as a
 * deconvolution.
 *
 * @param x The input image, of rank 4 or rank 3, of shape
 * `[batch, height, width, inDepth]`. If rank 3, batch of 1 is assumed.
 * @param filter The filter, rank 4, of shape
 * `[filterHeight, filterWidth, outDepth, inDepth]`.
 * `inDepth` must match `inDepth` in `x`.
 * @param outputShape Output shape, of rank 4 or rank 3:
 * `[batch, height, width, outDepth]`. If rank 3, batch of 1 is assumed.
 * @param strides The strides of the original convolution:
 * `[strideHeight, strideWidth]`.
 * @param pad The type of padding algorithm used in the non-transpose version
 * of the op.
 * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is
 * provided, it will default to truncate.
 * @doc {heading: 'Operations', subheading: 'Convolution'}
 */
function conv2dTranspose_<T extends Tensor3D|Tensor4D>(\n x:

```



```
T|TensorLike, filter: Tensor4D|TensorLike,\n outputShape: [number, number, number, number][[number, number,
number],\n strides: [number, number]]number, pad: 'valid'|'same'|number,\n dimRoundingMode?:
'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'conv2dTranspose');\n const $filter =
convertToTensor(filter, 'filter', 'conv2dTranspose');\n\n return conv2DBackpropInput(\n outputShape, $x, $filter,
strides, pad, 'NHWC', dimRoundingMode);\n}\n\nexport const conv2dTranspose =
op({conv2dTranspose_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n
*\nimport {ENGINE} from './engine';\nimport {Conv3D, Conv3DAttrs, Conv3DInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport
{eitherStridesOrDilationsAreOne} from './conv_util';\nimport {op} from './operation';\nimport {reshape} from
'./reshape';\n\n/**\n * Computes a 3D convolution over the input x.\n * @param x The input tensor, of rank 5 or
rank 4, of shape\n * `[batch, depth, height, width, channels]`. If rank 4,\n * batch of 1 is assumed.\n * @param
filter The filter, rank 5, of shape\n * `[filterDepth, filterHeight, filterWidth, inChannels, outChannels]`.\n *
inChannels must match between input and filter.\n * @param strides The strides of the convolution: `[strideDepth,
strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output
will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter
is larger\n * than 1x1.\n * - For more info, see this guide:\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution(\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat: An optional string from from:
`NDHWC`, `NCDHW`. Defaults to\n * `NDHWC`. Specify the data format of the input and output data.
With the\n * default format `NDHWC`, the data is stored in the order of: [batch,\n * depth, height, width,
channels]. Only `NDHWC` is currently supported.\n * @param dilations The dilation rates: `[dilationDepth,
dilationHeight,\n * dilationWidth]` in which we sample input values across the height\n * and width
dimensions in atrous convolution. Defaults to `[1, 1, 1]`.\n * If `dilations` is a single number, then\n *
`dilationDepth == dilationHeight == dilationWidth`. If it is greater\n * than 1, then all values of `strides` must be
1.\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv3d<T extends
Tensor4D|Tensor5D>(\n x: T|TensorLike, filter: Tensor5D|TensorLike,\n strides: [number, number,
number][number, number, pad: 'valid'|'same',\n dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC',\n dilations: [number,
number, number][number = [1, 1, 1]): T {\n const $x = convertToTensor(x, 'x', 'conv3d');\n const $filter =
convertToTensor(filter, 'filter', 'conv3d');\n\n let x5D = $x as Tensor5D;\n let reshapedTo5D = false;\n if
($x.rank === 4) {\n reshapedTo5D = true;\n x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2],
$x.shape[3]]);\n }\n util.assert(\n x5D.rank === 5,\n () => `Error in conv3d: input must be rank 5, but got
rank ${x5D.rank}.`);\n util.assert(\n $filter.rank === 5,\n () => `Error in conv3d: filter must be rank 5, but got
rank ` +\n `${$filter.rank}.`);\n util.assert(\n x5D.shape[4] === $filter.shape[3],\n () => `Error in
conv3d: depth of input (${x5D.shape[4]}) must match ` +\n `input depth for filter ${$filter.shape[3]}.`);\n util.assert(\n eitherStridesOrDilationsAreOne(strides, dilations),\n () => 'Error in conv3D: Either strides or
dilations must be 1.' +\n `Got strides ${strides} and dilations '${dilations}'`);\n util.assert(\n dataFormat
=== 'NDHWC',\n () => `Error in conv3d: got dataFormat of ${\n dataFormat} but only NDHWC is
currently supported.`);\n\n const inputs: Conv3DInputs = {x: x5D, filter: $filter};\n const attrs: Conv3DAttrs =
{strides, pad, dataFormat, dilations};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res =
```

```

ENGINE.runKernel(\n Conv3D, inputs as {} as NamedTensorMap,\n attrs as {} as\nNamedAttrMap) as T;\n\n if (reshapedTo5D) {\n return reshape(\n res, [res.shape[1], res.shape[2],\nres.shape[3], res.shape[4]]) as\n T;\n }\n return res;\n}\n\nexport const conv3d = op({conv3d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
=====
*\nimport {ENGINE} from './engine';\nimport {Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs,\nConv3DBackpropInputV2Inputs} from './kernel_names';\nimport {NamedAttrMap} from\n './kernel_registry';\nimport {Tensor4D, Tensor5D} from './tensor';\nimport {NamedTensorMap} from\n './tensor_types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/**\n * Computes the derivative of the input of a 3D convolution.\n * @param xShape The shape\n * of the input: [batch, depth, height, width,\n * in_channels]. If length of 4, batch of 1 is assumed.\n * @param dy The\n * derivative of the output, of rank 5 or rank 4 of shape\n * [batch, outDepth, outHeight, outWidth, in_channels].\n * If rank 4, batch of 1 is assumed.\n * @param filter The filter, rank 5, of shape\n * [filterDepth, filterHeight,\n * filterWidth, inDepth, outDepth].\n * @param strides The strides of the convolution: [strideDepth, strideHeight,\n * strideWidth].\n * @param pad The type of padding algorithm used:\n * - `same` and stride 1: output will be of\n * same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is\n * larger\n * than 1x1.\n */\nfunction conv3DBackpropInput_<T extends Tensor4D|Tensor5D>(\n xShape:\n [number, number, number, number,\n number][number, number, number, number],\n dy: T, filter: Tensor5D,\n strides: [number, number, number]number,\n pad: 'valid'|'same'): T {\n util.assert(\n xShape.length ===\n dy.rank,\n () => `Length of inShape ` +\n `(${xShape.length}) and rank of dy (${dy.rank}) must\n match`);\n let xShape5D = xShape as [number, number, number, number, number];\n let dy5D = dy as\n Tensor5D;\n let reshapedTo5D = false;\n if (dy.rank === 4) {\n reshapedTo5D = true;\n dy5D = reshape(dy, [1,\n dy.shape[0], dy.shape[1], dy.shape[2], dy.shape[3]]);\n xShape5D = [1, xShape[0], xShape[1], xShape[2],\n xShape[3]];\n }\n const inDepth = xShape5D[4];\n const outDepth = dy5D.shape[4];\n util.assert(\n xShape5D.length === 5,\n () =>\n `Error in conv3dDerInput: inShape must be length 5, but got length ` +\n `${xShape5D.length}`);\n util.assert(\n dy5D.rank === 5,\n () => `Error in conv3dDerInput: dy must be\n rank 5, but got ` +\n `rank ${dy5D.rank}`);\n util.assert(\n filter.rank === 5,\n () => `Error in\n conv3dDerInput: filter must be rank 5, but got ` +\n `rank ${filter.rank}`);\n util.assert(\n inDepth ===\n filter.shape[3],\n () => `Error in conv3dDerInput: depth of input (${inDepth}) must ` +\n `match input\n depth for filter ${filter.shape[3]}`);\n util.assert(\n outDepth === filter.shape[4],\n () => `Error in\n conv3dDerInput: depth of output (${outDepth}) must ` +\n `match output depth for filter\n ${filter.shape[4]}`);\n const inputs: Conv3DBackpropInputV2Inputs = {dy: dy5D, filter};\n const attrs:\n Conv3DBackpropInputV2Attrs = {pad, strides, inputShape: xShape5D};\n // tslint:disable-next-line: no-\n unnecessary-type-assertion\n const res = ENGINE.runKernel(\n Conv3DBackpropInputV2, inputs as {\n as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n }\n if (reshapedTo5D) {\n return\n reshape(\n res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n T;\n }\n return\n res;\n}\n\nexport const conv3DBackpropInput = op({conv3DBackpropInput_});\n"/**\n * @license\n * Copyright\n2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

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=====
\n
*\nimport {Tensor4D, Tensor5D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {conv3DBackpropInput} from './conv3d_backprop_input';\nimport {op}
from './operation';\n\n/**\n * Computes the transposed 3D convolution of a volume, also known as a\n *
deconvolution.\n * \n * @param x The input image, of rank 5 or rank 4, of shape\n * `[batch, depth, height, width,
inDepth]`. If rank 4, batch of 1 is assumed.\n * @param filter The filter, rank 4, of shape\n * `[depth, filterHeight,
filterWidth, outDepth, inDepth]`. \n * `inDepth` must match `inDepth` in `x`.\n * @param outputShape Output
shape, of rank 5 or rank 4:\n * `[batch, depth, height, width, outDepth]`. If rank 3, batch of 1 is\n * assumed.\n *
@param strides The strides of the original convolution:\n * `[strideDepth, strideHeight, strideWidth]`.\n *
@param pad The type of padding algorithm used in the non-transpose version\n * of the op.\n * \n * @doc
{heading: 'Operations', subheading: 'Convolution'}\n *\nfunction conv3dTranspose<T extends
Tensor4D|Tensor5D>(\n x: T|TensorLike, filter: Tensor5D|TensorLike,\n outputShape: \n [number, number,
number, number, \n number][number, number, number, number], \n strides: [number, number,
number, number], \n pad: 'valid'|'same'): T {\n const $x = convertToTensor(x, 'x', 'conv3dTranspose');\n const $filter =
convertToTensor(filter, 'filter', 'conv3dTranspose');\n\n return conv3DBackpropInput(outputShape, $x, $filter,
strides, pad);\n}\n\nexport const conv3dTranspose = op({conv3dTranspose_});\n", "/*\n * @license\n * Copyright
2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
\n
*\n\nimport {ENGINE} from './engine';\nimport {Cos, CosInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
cos of the input `tf.Tensor` element-wise: `cos(x)`\n * \n * ``js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3
/ 4]);\n * \n * x.cos().print(); // or tf.cos(x)\n * ``\n * @param x The input tensor.\n * \n * @doc {heading:
'Operations', subheading: 'Basic math'}\n *\nfunction cos<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'cos');\n\n const inputs: CosInputs = {x: $x};\n\n return ENGINE.runKernel(Cos, inputs as
{} as NamedTensorMap);\n}\n\nexport const cos = op({cos_});\n", "/*\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====
\n
*\n\nimport {ENGINE} from './engine';\nimport {Cosh, CoshInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
hyperbolic cos of the input `tf.Tensor` element-wise: `cosh(x)`\n * \n * ``js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *
\n * x.cosh().print(); // or tf.cosh(x)\n * ``\n * @param x The input tensor.\n * \n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction cosh<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'cosh');\n\n const inputs: CoshInputs = {x: $x};\n\n return ENGINE.runKernel(Cosh, inputs
as {} as NamedTensorMap);\n}\n\nexport const cosh = op({cosh_});\n", "/*\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```





```

DepthwiseConv2dNativeInputs} from './kernel_names';\nimport {NamedAttrMap} from
 './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport
 * as util from './util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Depthwise
 2D convolution.\n * Given a 4D `input` array and a `filter` array of shape\n * `[filterHeight, filterWidth,
 inChannels, channelMultiplier]` containing\n * `inChannels` convolutional filters of depth 1, this op applies a\n *
 different filter to each input channel (expanding from 1 channel to\n * `channelMultiplier` channels for each), then
 concatenates the results\n * together. The output has `inChannels * channelMultiplier` channels.\n * See\n *
 [https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d](\n *
 https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d)\n * for more details.\n *\n * @param x The
 input tensor, of rank 4 or rank 3, of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n *
 assumed.\n * @param filter The filter tensor, rank 4, of shape\n * `[filterHeight, filterWidth, inChannels,
 channelMultiplier]`\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`. If
 strides is a single number, then `strideHeight ==\n * strideWidth`\n * @param pad The type of padding algorithm.\n * -
 `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will
 be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n *
 [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
 https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates:
 `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and width dimensions\n *
 in atrous convolution. Defaults to `[1, 1]`. If `rate` is a single\n * number, then `dilationHeight ==
 dilationWidth`. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param dataFormat: An
 optional string from: `NHWC`, `NCHW`. Defaults to\n * `NHWC`. Specify the data format of the input and
 output data. With the\n * default format `NHWC`, the data is stored in the order of: [batch,\n * height, width,
 channels]. Only `NHWC` is currently supported.\n * @param dimRoundingMode A string from: 'ceil', 'round',
 'floor'. If none is\n * provided, it will default to truncate.\n *\n * @doc {heading: 'Operations', subheading:
 'Convolution'}\n *\nfunction depthwiseConv2d<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filter:
 Tensor4D|TensorLike,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dataFormat:
 'NHWC'|'NCHW' = 'NHWC',\n dilations: [number, number]|number = [1, 1],\n dimRoundingMode?:
 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'depthwiseConv2d');\n const $filter =
 convertToTensor(filter, 'filter', 'depthwiseConv2d');\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n
if ($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n
}\n\n util.assert(\n x4D.rank === 4,\n () => `Error in depthwiseConv2d: input must be rank 4, but got ` +\n
`rank ${x4D.rank}.`);\n util.assert(\n $filter.rank === 4,\n () => `Error in depthwiseConv2d: filter must be
rank 4, but got rank ` +\n ` ${$filter.rank}.`);\n util.assert(\n x4D.shape[3] === $filter.shape[2],\n () =>
`Error in depthwiseConv2d: number of input channels ` +\n ` (${x4D.shape[3]}) must match the inChannels
dimension in ` +\n ` filter ${$filter.shape[2]}.`);\n\n if (dimRoundingMode != null) {\n util.assert(\n
util.isInt(pad as number),\n () => `Error in depthwiseConv2d: pad must be an integer when using, ` +\n
`dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs:
DepthwiseConv2dNativeInputs = {x: x4D, filter: $filter};\n const attrs: DepthwiseConv2dNativeAttrs =\n
{strides, pad, dataFormat, dilations, dimRoundingMode};\n\n // tslint:disable-next-line: no-unnecessary-type-
assertion\n const res = ENGINE.runKernel(\n DepthwiseConv2dNative, inputs as {} as
NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res,
[res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n\n return res;\n}\n\nexport const depthwiseConv2d =
op({depthwiseConv2d_});\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the `License`);\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES

```

OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

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=====
\n
*\n\nimport {ENGINE} from './engine';\nimport {Diag, DiagInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\n\nimport {op} from './operation';\n\n/**\n * Returns a diagonal tensor with a given diagonal
values.\n *\n * Given a diagonal, this operation returns a tensor with the diagonal and\n * everything else padded
with zeros.\n *\n * Assume the input has dimensions `[D1,..., Dk]`, then the output is a tensor\n * of rank 2k with
dimensions `[D1,..., Dk, D1,..., Dk]`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n *\n * tf.diag(x).print()\n * ```\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4, 5, 6, 6, 8], [4, 2]);\n *\n * tf.diag(x).print()\n * ```\n * @param x The
input tensor.\n *\n\nfunction diag_(x: Tensor): Tensor {\n const $x = convertToTensor(x, 'x', 'diag');\n\n const
inputs: DiagInputs = {x: $x};\n\n return ENGINE.runKernel(Diag, inputs as {} as NamedTensorMap);\n}\n\n\nexport
const diag = op({diag_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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\n
*\n\nimport {ENGINE} from './engine';\nimport {Dilation2D, Dilation2DAttrs, Dilation2DInputs} from
'./kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from
'./tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
'./tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from
'./operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the grayscale dilation over the input `x`.\n *\n * @param x The input tensor, rank 3 or rank 4 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch
of 1 is assumed.\n * @param filter The filter tensor, rank 3, of shape\n * `[filterHeight, filterWidth, depth]`.\n * @param strides The strides of the sliding window for each dimension of the\n * input tensor: `[strideHeight,
strideWidth]`. If `strides` is a single number,\n * then `strideHeight == strideWidth`.\n * @param pad The
type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of
filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1*1x1.\n * - For more
info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat Specify the data format of
the input and output data.\n * Defaults to 'NHWC'. Only 'NHWC' is currently supported. With the\n * default
format "NHWC", the data is stored in the order of: [batch,\n * height, width, channels].\n * @param dilations
The dilation rates: `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and
width dimensions\n * for atrous morphological dilation. Defaults to `[1, 1]`. If `dilations`\n * is a single
number, then `dilationHeight == dilationWidth`. If it is\n * greater than 1, then all values of `strides` must be 1.\n
*\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n *\n\nfunction dilation2d_<T extends
Tensor3D|Tensor4D>(\n x: T|TensorLike, filter: Tensor3D|TensorLike,\n strides: [number, number]|number,\n pad: 'valid'|'same',\n dilations: [number, number]|number = [1, 1],\n dataFormat: 'NHWC' = 'NHWC'): T {\n const $x = convertToTensor(x, 'x', 'dilation2d');\n const $filter = convertToTensor(filter, 'filter', 'dilation2d');\n util.assert(\n $x.rank === 3 || $x.rank === 4,\n () => `Error in dilation2d: input must be rank 3 or 4, but got
rank ` +\n `${$x.rank}`);\n util.assert(\n $filter.rank === 3,\n () => `Error in dilation2d: filter must be
rank 3, but got rank ` +\n `${$filter.rank}`);\n util.assert(\n dataFormat === 'NHWC',\n () => `Error in
dilation2d: Only NHWC is currently supported, ` +\n `but got dataFormat of ${dataFormat}`);\n\n let x4D =
$x as Tensor4D;\n let reshapedTo4D = false;\n\n if ($x.rank === 3) {\n x4D = reshape($x, [1, $x.shape[0],
$x.shape[1], $x.shape[2]]);\n reshapedTo4D = true;\n }\n\n const inputs: Dilation2DInputs = {x: x4D, filter:
=====
```

```

$filter});\n const attrs: Dilation2DAttrs = {strides, pad, dilations};\n // tslint:disable-next-line: no-unnecessary-
type-assertion\n const res = ENGINE.runKernel(\n Dilation2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2],
res.shape[3]]) as T;\n }\n\n return res;\n}\n\n\nexport const dilation2d = op({dilation2d_});\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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the specific language governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\n/**\n * Returns the dimensions in the input shape that are broadcasted to\n * produce the provided output
shape.\n * The returned dimensions are 0-indexed and sorted. An example:\n * inShape = [4, 1, 3]\n * outShape
= [5, 4, 3, 3]\n * result = [1]. Dimension 1 (2nd dimension of input) gets broadcasted 1 => 3.\n */\nexport function
getBroadcastDims(\n inShape: number[], outShape: number[]): number[] {\n const inRank = inShape.length;\n const
dims: number[] = [];\n for (let i = 0; i < inRank; i++) {\n const dim = inRank - 1 - i;\n const a =
inShape[dim] || 1;\n const b = outShape[outShape.length - 1 - i] || 1;\n if (b > 1 && a === 1) {\n
dims.unshift(dim);\n }\n }\n return dims;\n}\n\n/**\n * Returns the axes in the output space that should be
reduced to produce\n * the input space.\n */\nexport function getReductionAxes(\n inShape: number[], outShape:
number[]): number[] {\n const result: number[] = [];\n for (let i = 0; i < outShape.length; i++) {\n const inDim =
inShape[inShape.length - i - 1];\n const outAxis = outShape.length - i - 1;\n const outDim =
outShape[outAxis];\n if (inDim === null || (inDim === 1 && outDim > 1)) {\n result.unshift(outAxis);\n }\n
}\n return result;\n}\n\nexport function assertAndGetBroadcastShape(\n shapeA: number[], shapeB: number[]):
number[] {\n const result: number[] = [];\n const l = Math.max(shapeA.length, shapeB.length);\n\n for (let i = 0; i
< l; i++) {\n let a = shapeA[shapeA.length - i - 1];\n if (a === null) {\n a = 1;\n }\n let b =
shapeB[shapeB.length - i - 1];\n if (b === null) {\n b = 1;\n }\n if (a === 1) {\n result.unshift(b);\n
}\n else if (b === 1) {\n result.unshift(a);\n }\n else if (a !== b) {\n const errMsg = `Operands could not be
broadcast together with shapes ` +\n `${shapeA} and ${shapeB}`;\n throw Error(errMsg);\n }\n else {\n
result.unshift(a);\n }\n }\n return result;\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

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=====\n
*/\nimport {ENGINE} from './engine';\nimport {Equal, EqualInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth
value of (a == b) element-wise. Supports broadcasting.\n */\nexport function equal(\n a: Tensor|TensorLike, b:
Tensor|TensorLike): boolean {\n const inputs: EqualInputs = {a: a, b: b};\n return ENGINE.runKernel(Equal,
inputs as {} as NamedTensorMap);\n}\n\n\nexport const equal =
op({equal_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the

```



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```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Select, SelectInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assert, assertShapesMatch} from './util';\nimport {broadcastTo} from './broadcast_to';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the elements, either `a` or `b` depending on the\n * condition.\n * If the condition is true, select from `a`, otherwise select from `b`.\n *`js\n * const cond = tf.tensor1d([false, false, true], 'bool');\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([-1, -2, -3]);\n * a.where(cond, b).print();\n *`*\n * @param condition The input condition. Must be of dtype bool.\n * @param a If `condition` is rank 1, `a` may have a higher rank but its first dimension must match the size of `condition`.\n * @param b A tensor with the same dtype as `a` and with shape that is compatible with `a`.\n * @return A tensor with same dtype as `a` and `b`, and shape that is broadcastable from `a` and `b`.\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction where_<T extends Tensor>(\n condition: Tensor|TensorLike, a: T|TensorLike, b: T|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'where');\n const $b = convertToTensor(b, 'b', 'where');\n const $condition = convertToTensor(condition, 'condition', 'where', 'bool');\n // TODO: move this logic to forward function when the broadcastTo op is implemented in WASM.\n // Find the broadcastable shape for $a and $b.\n const broadcastShape = assertAndGetBroadcastShape($a.shape, $b.shape);\n const $broadcastedA = broadcastTo($a, broadcastShape);\n const $broadcastedB = broadcastTo($b, broadcastShape);\n if ($condition.rank === 1) {\n // If condition rank is 1, then the first dimension must match the size of\n // condition.\n assert($condition.shape[0] === $a.shape[0], () => 'The first dimension of `a` must match the size of `condition`.');\n }\n if ($condition.rank !== 1) {\n // A must have the same shape as condition.\n assertShapesMatch($condition.shape, $broadcastedB.shape, 'Error in where: '); \n }\n const inputs: SelectInputs = {\n condition: $condition,\n t: $broadcastedA,\n e: $broadcastedB\n }; \n return ENGINE.runKernel(Select, inputs as unknown as NamedTensorMap);\n}\n\nexport const where = op({where_});\n\n/**\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

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=====
*\n\nimport {ENGINE} from './engine';\nimport {ZerosLike, ZerosLikeInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 0 with the same shape as the\n * given tensor.\n *`js\n * const x = tf.tensor([1, 2]);\n * tf.zerosLike(x).print();\n *`*\n * @param x The tensor of required shape.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction zerosLike_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'zerosLike');\n const inputs: ZerosLikeInputs = {x: $x};\n return ENGINE.runKernel(ZerosLike, inputs as {} as NamedTensorMap);\n}\n\nexport const zerosLike = op({zerosLike_});\n\n/**\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n */\n
```

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```
=====\n*\n\nimport {Tensor} from './tensor';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {div} from './div';\nimport {equal} from './equal';\nimport {op} from './operation';\nimport {where} from './where';\nimport {zerosLike} from './zeros_like';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting. Return 0\n * if denominator is 0.\n *\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n * const c = tf.tensor1d([0, 0, 0, 0]);\n *\n * a.divNoNaN(b).print(); // or tf.divNoNaN(a, b)\n * a.divNoNaN(c).print(); // or tf.divNoNaN(a, c)\n *\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n * const c = tf.scalar(0);\n *\n * a.divNoNaN(b).print(); // or tf.divNoNaN(a, b)\n * a.divNoNaN(c).print(); // or tf.divNoNaN(a, c)\n *\n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator. Must have the same dtype as\n * `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction divNoNaN_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n // TODO: Make this into its own kernel.\n let $a = convertToTensor(a, 'a', 'div');\n let $b = convertToTensor(b, 'b', 'div');\n [$a, $b] = makeTypesMatch($a, $b);\n const divResult = div($a, $b);\n const zeros = zerosLike(divResult);\n const bEqualsZero = equal($b, zeros);\n return where(bEqualsZero, zeros, divResult) as T;\n}\n\nexport const divNoNaN = op({divNoNaN_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n
```

```
=====\n*\n\nimport {Tensor,} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {matMul} from './mat_mul';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the dot product of two matrices and/or vectors, `t1` and `t2`.\n *\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor2d([[1, 2], [3, 4]]);\n * const c = tf.tensor2d([[1, 2, 3], [4, 5, 6]]);\n *\n * a.dot(b).print(); // or tf.dot(a, b)\n * b.dot(a).print();\n * b.dot(c).print();\n *\n * @param t1 The first tensor in the dot operation.\n * @param t2 The second tensor in the dot operation.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction dot_(t1: Tensor|TensorLike, t2: Tensor|TensorLike): Tensor {\n const $t1 = convertToTensor(t1, 't1', 'dot');\n const $t2 = convertToTensor(t2, 't2', 'dot');\n util.assert(\n ($t1.rank === 1 || $t1.rank === 2) && ($t2.rank === 1 || $t2.rank === 2),\n () => `Error in dot: inputs must all be rank 1 or 2, but got ranks ` +\n `${$t1.rank} and `${$t2.rank}`.`);\n const t1Inner = ($t1.rank === 1 ? $t1.size : $t1.shape[1]);\n const t2Inner = ($t2.rank === 1 ? $t2.size : $t2.shape[0]);\n util.assert(\n t1Inner === t2Inner,\n () => `Error in dot: inner dimensions of inputs must match, but got ` +\n `${t1Inner} and `${t2Inner}`.`);\n if ($t1.rank === 1 && $t2.rank === 1) {\n const t12D = reshape($t1, [1, -1]);\n const t22D = reshape($t2, [-1, 1]);\n const t1t2 = matMul(t12D, t22D);\n return reshape(t1t2, []);\n } else if ($t1.rank === 1 && $t2.rank === 2) {\n const t12D = reshape($t1, [1, -1]);\n const t22D = reshape($t2, [$t2.shape[0], $t2.shape[1]]);\n const t1t2 = matMul(t12D, t22D);\n return reshape(t1t2, [t1t2.size]);\n } else if ($t1.rank === 2 && $t2.rank === 1) {\n const t22D = reshape($t2, [-1, 1]);\n const t1t2 = matMul($t1, t22D);\n return reshape(t1t2, [t1t2.size]);\n } else {\n const t22D = reshape($t2, [$t2.shape[0], $t2.shape[1]]);\n const t1t2 = matMul($t1, t22D);\n return t1t2;\n }\n}\n\nexport const dot = op({dot_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n */\n
```

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```
=====
import {ENGINE} from './engine';import {Elu, EluInputs} from './kernel_names';import {Tensor} from './tensor';import {NamedTensorMap} from './tensor_types';import {convertToTensor} from './tensor_util_env';import {TensorLike} from './types';import {op} from './operation';
/** Computes exponential linear element-wise: $x > 0 ? e^x - 1 : 0$.
const x = tf.tensor1d([-1, 1, -3, 2]);
x.elu().print(); // or tf.elu(x)
@param x The input tensor.
@doc {heading: 'Operations', subheading: 'Basic math'}
function elu<T extends Tensor>(x: T|TensorLike): T {
 const $x = convertToTensor(x, 'x', 'elu');
 const inputs: EluInputs = {x: $x};
 return ENGINE.runKernel(Elu, inputs as {
 } as NamedTensorMap);
}
export const elu = op({elu});
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Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.
```

```
=====
import {ENGINE} from './engine';import {Erf, ErfInputs} from './kernel_names';import {Tensor} from './tensor';import {NamedTensorMap} from './tensor_types';import {convertToTensor} from './tensor_util_env';import {TensorLike} from './types';import * as util from './util';import {cast} from './cast';import {op} from './operation';
/** Computes gauge error function of the input `tf.Tensor` element-wise:
`erf(x)`
const x = tf.tensor1d([0, .1, -.1, .7]);
x.erf().print(); // or tf.erf(x)
@param x The input tensor.
@doc {heading: 'Operations', subheading: 'Basic math'}
function erf<T extends Tensor>(x: T|TensorLike): T {
 let $x = convertToTensor(x, 'x', 'erf');
 util.assert($x.dtype === 'int32' || $x.dtype === 'float32',
 () => 'Input dtype must be `int32` or `float32`');
 if ($x.dtype === 'int32')
 $x = cast($x, 'float32');
 const inputs: ErfInputs = {x: $x};
 return ENGINE.runKernel(Erf, inputs as {
 } as NamedTensorMap);
}
export const erf = op({erf});
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Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.
```

```
=====
import {ENGINE} from './engine';import {Exp, ExpInputs} from './kernel_names';import {Tensor} from './tensor';import {NamedTensorMap} from './tensor_types';import {convertToTensor} from './tensor_util_env';import {TensorLike} from './types';import {op} from './operation';
/** Computes exponential of the input `tf.Tensor` element-wise.
`e^x`
const x = tf.tensor1d([1, 2, -3]);
x.exp().print(); // or tf.exp(x)
@param x The input tensor.
@doc {heading: 'Operations', subheading: 'Basic math'}
function exp<T extends Tensor>(x: T|TensorLike): T {
 const $x = convertToTensor(x, 'x', 'exp');
 const inputs: ExpInputs = {x: $x};
 return ENGINE.runKernel(Exp, inputs as {
 } as NamedTensorMap);
}
export const exp = op({exp});
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```

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OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language  
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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport\n {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Returns a\n * `tf.Tensor` that has expanded rank, by inserting a dimension\n * into the tensor's shape.\n *
*\n * ```js\n * const x =\n * tf.tensor1d([1, 2, 3, 4]);\n * const axis = 1;\n * x.expandDims(axis).print();\n * ```\n *
*\n * @param x The input\n * tensor whose dimensions to be expanded.\n * @param axis The dimension index at which to insert shape of `1`.\n * Defaults\n * to 0 (the first dimension).\n *
*\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n *\n * \nfunction expandDims<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x =\n convertToTensor(x, 'x', 'expandDims', 'string_or_numeric');\n util.assert(axis <= $x.rank, () => 'Axis must be <=\n rank of the tensor');\n const inputs: ExpandDimsInputs = {input: $x};\n const attrs: ExpandDimsAttrs = {dim:\n axis};\n return ENGINE.runKernel(\n ExpandDims, inputs as { } as NamedTensorMap, attrs as { }\n as\n NamedAttrMap);\n}\n\nexport const expandDims = op({expandDims_});\n\n"/**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Expml, ExpmlInputs} from './kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes\n * exponential of the input `tf.Tensor` minus one element-wise.\n *
*\n * ```js\n * const x = tf.tensor1d([1,\n * 2, -3]);\n * x.expml().print(); // or tf.expml(x)\n * ```\n *
*\n * @param x The input tensor.\n *
*\n * @doc {heading:\n * 'Operations', subheading: 'Basic math'}\n *\n * \nfunction expml<T extends Tensor>(x: T|TensorLike): T {\n const $x\n = convertToTensor(x, 'x', 'expml');\n const inputs: ExpmlInputs = {x: $x};\n return ENGINE.runKernel(Expml,\n inputs as { } as NamedTensorMap);\n}\n\nexport const expml = op({expml_});\n\n"/**\n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Tile, TileAttrs, TileInputs} from './kernel_names';\nimport\n {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from\n './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport\n * as util from './util';\nimport {op} from './operation';\n\n/**\n * Construct a tensor by repeating it the number of\n * times given by reps.\n *
*\n * This operation creates a new tensor by replicating `input` `reps`\n * times. The output\n * tensor's i'th dimension has `input.shape[i] * reps[i]` elements,
and the values of `input` are replicated\n * `reps[i]` times along the i'th dimension. For example, tiling\n * `[a, b, c, d]` by `[2]` produces `[a, b, c, d, a, b, c,
```

```

d]`.\n *\n * ````js\n * const a = tf.tensor1d([1, 2]);\n *\n * a.tile([2]).print(); // or a.tile([2])\n *\n * ````\n *\n * ````js\n * const a = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * a.tile([1, 2]).print(); // or a.tile([1, 2])\n *\n * ````\n * @param x The tensor to tile.\n * @param reps Determines the number of replications per dimension.\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction tile_<T extends Tensor>(x: T|TensorLike, reps: number[]): T {\n const $x = convertToTensor(x, 'x', 'tile', 'string_or_numeric');\n util.assert(\n $x.rank === reps.length,\n () => `Error in transpose: rank of input ${$x.rank}` +\n ` must match length of reps ${reps}.`);\n const inputs: TileInputs = {x: $x};\n const attrs: TileAttrs = {reps};\n return ENGINE.runKernel(\n Tile, inputs as unknown as NamedTensorMap,\n attrs as unknown as NamedAttrMap);\n}\n\nexport const tile = op({tile_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Tensor2D} from './tensor';\nimport {DataType} from './types';\nimport {buffer} from './buffer';\nimport {expandDims} from './expand_dims';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {tile} from './tile';\n\n/**\n * Create an identity matrix.\n *\n * @param numRows Number of rows.\n * @param numColumns Number of columns. Defaults to `numRows`.\n * @param batchSize If provided, will add the batch shape to the beginning\n * of the shape of the returned `tf.Tensor` by repeating the identity\n * matrix.\n * @param dtype Data type.\n * @returns Identity matrix of the specified size and data type, possibly\n * with batch repetition if `batchShape` is specified.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction eye_(\n numRows: number, numColumns?: number,\n batchSize?:\n [\n number\n]|[\n number,\n number\n]|[\n number, number, number\n]|[\n number, number, number, number\n],\n dtype: DataType = 'float32'): Tensor2D {\n if (numColumns == null) {\n numColumns = numRows;\n }\n const buff = buffer([\n numRows, numColumns\n], dtype);\n const n = numRows <= numColumns ? numRows : numColumns;\n for (let i = 0; i < n; ++i) {\n buff.set(1, i, i);\n }\n const out: Tensor2D = reshape(buff.toTensor(), [\n numRows, numColumns\n]);\n if (batchShape == null) {\n return out;\n } else {\n if (batchShape.length === 1) {\n return tile(expandDims(out, 0), [batchShape[0], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 2) {\n // tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(\n expandDims(expandDims(out, 0), 0),\n [batchShape[0], batchShape[1], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 3) {\n // tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(expandDims(expandDims(expandDims(out, 0), 0), 0), [\n batchShape[0], batchShape[1], batchShape[2], 1, 1\n]) as Tensor2D;\n } else {\n throw new Error(\n `eye() currently supports only 1D and 2D` +\n ` // tslint:disable-next-line:no-any\n `batchShapes, but received ${batchShape as any}.length`);\n }\n }\n}\n\nexport const eye = op({eye_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {ENGINE} from './engine';\nimport {Fill, FillAttrs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\n\n/**\n * Creates a `tf.Tensor` filled with a scalar value.\n *\n * ````js\n * tf.fill([2, 2], 4).print();\n * ````\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param value The scalar value to fill

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the tensor with.  
 @param dtype The type of an element in the resulting tensor. Defaults to 'float'.  
 @doc {heading: 'Tensors', subheading: 'Creation'}  
 ^\nfunction fill<R extends Rank>(shape: ShapeMap[R], value: number|string, dtype?: DataType): Tensor<R> {\n const attrs: FillAttrs = {shape, value, dtype};\n\n return ENGINE.runKernel(Fill, {}, attrs as {} as NamedAttrMap);\n}\n\nexport {fill};\n"/\*\*\n \* @license\n \* Copyright 2018 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the "License");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* \n \* http://www.apache.org/licenses/LICENSE-2.0\n \* \n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an "AS IS" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====
*\nimport {ENGINE} from './engine';\nimport {Floor, FloorInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes floor of input `tf.Tensor` element-wise: `floor(x)`.\n * \n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n * \n * x.floor().print(); // or tf.floor(x)\n * \n * @param x The input tensor.\n * \n * @doc {heading: 'Operations', subheading: 'Basic math'}\n * \nfunction floor<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'floor');\n\n const inputs: FloorInputs = {x: $x};\n return ENGINE.runKernel(Floor, inputs as {} as NamedTensorMap);\n}\n\nexport const floor = op({floor_});\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====
*\nimport {ENGINE} from './engine';\nimport {GatherV2, GatherV2Attrs, GatherV2Inputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Gather slices from tensor `x`'s axis `axis` according to `indices`.\n * \n * const x = tf.tensor1d([1, 2, 3, 4]);\n * \n * const indices = tf.tensor1d([1, 3, 3, 'int32']);\n * \n * x.gather(indices).print();\n * \n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * \n * const indices = tf.tensor1d([1, 1, 0], 'int32');\n * \n * x.gather(indices).print();\n * \n * @param x The input tensor whose slices to be gathered.\n * @param indices The indices of the values to extract.\n * @param axis The axis over which to select values. Defaults to 0.\n * @param batchDims Optional. The number of batch dimensions. It must be less than or equal to rank(indices). Defaults to 0. The output tensor will have shape of `x.shape[:axis] + indices.shape[batchDims:] + x.shape[axis + 1:]`.\n * \n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n * \nfunction gather<T extends Tensor>(x: T|TensorLike, indices: Tensor|TensorLike, axis = 0, batchDims = 0): T {\n const $x = convertToTensor(x, 'x', 'gather');\n const $indices = convertToTensor(indices, 'indices', 'gather', 'int32');\n\n const inputs: GatherV2Inputs = {x: $x, indices: $indices};\n const attrs: GatherV2Attrs = {axis, batchDims};\n\n return ENGINE.runKernel(GatherV2, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const gather = op({gather_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====
*\nimport {ENGINE} from './engine';\nimport {Greater, GreaterInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth
 value of (a > b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b =
 tf.tensor1d([2, 2, 2]);\n * a.greater(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The
 second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n
\n\nfunction greater_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a =
convertToTensor(a, 'a', 'greater');\n let $b = convertToTensor(b, 'b', 'greater');\n [$a, $b] = makeTypesMatch($a,
$b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterInputs = {a: $a, b: $b};\n\n return
ENGINE.runKernel(Greater, inputs as { } as NamedTensorMap);\n}\n\nexport const greater =
op({greater_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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```

=====
*\nimport {ENGINE} from './engine';\nimport {GreaterEqual, GreaterEqualInputs} from
 './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport
 {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from
 './operation';\n\n/**\n * Returns the truth value of (a >= b) element-wise. Supports broadcasting.\n *\n * ```js\n *
const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n * a.greaterEqual(b).print();\n * ```\n *\n
* @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n
* @doc {heading: 'Operations', subheading: 'Logical'}\n *\n*\nfunction greaterEqual_<T extends Tensor>(\n a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'greaterEqual');\n let $b =
convertToTensor(b, 'b', 'greaterEqual');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterEqualInputs = {a: $a, b: $b};\n\n return
ENGINE.runKernel(GreaterEqual, inputs as { } as NamedTensorMap);\n}\n\nexport const greaterEqual =
op({greaterEqual_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {Imag, ImagInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the
imaginary part of a complex (or real) tensor.\n *\n * Given a tensor input, this operation returns a tensor of type float
that is\n * the imaginary part of each element in input considered as a complex number.\n * If input is real, a tensor
of all zeros is returned.\n *\n * ```js\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.imag(x).print();\n *
```\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\n*\nfunction imag_<T extends Tensor>(input:
T|TensorLike): T {\n  const $input = convertToTensor(input, 'input', 'imag');\n\n  const inputs: ImagInputs = {input:

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$input});\n return ENGINE.runKernel(Imag, inputs as {} as NamedTensorMap);\n\n\nexport const imag =\nop({imag_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {IsFinite, IsFiniteInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from\n '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n\n/*\n * Returns\n * which elements of x are finite.\n * `js`\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n * x.isFinite().print(); // or tf.isNaN(x)\n * @param x The input Tensor.\n * @doc {heading: 'Operations',\n * subheading: 'Basic math'}\n */\nfunction isFinite_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n  convertToTensor(x, 'x', 'isFinite');\n  const inputs: IsFiniteInputs = {x: $x};\n  return\n  ENGINE.runKernel(IsFinite, inputs as {} as NamedTensorMap);\n}\n\nexport const isFinite =\nop({isFinite_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
```

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {IsInf, IsInfInputs} from '../kernel_names';\nimport {Tensor}\n from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from\n '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n\n/*\n * Returns\n * which elements of x are Infinity or -Infinity.\n * `js`\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n * x.isInf().print(); // or tf.isNaN(x)\n * @param x The input Tensor.\n * @doc {heading: 'Operations',\n * subheading: 'Basic math'}\n */\nfunction isInf_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n  convertToTensor(x, 'x', 'isInf');\n  const inputs: IsInfInputs = {x: $x};\n  return ENGINE.runKernel(IsInf, inputs\n  as {} as NamedTensorMap);\n}\n\nexport const isInf = op({isInf_});\n", "/*\n * @license\n * Copyright 2018 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {IsNaN, IsNaNInputs} from '../kernel_names';\nimport {Tensor}\n from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from\n '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n\n/*\n * Returns\n * which elements of x are NaN.\n * `js`\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n * x.isNaN().print(); // or tf.isNaN(x)\n * @param x The input Tensor.\n * @doc {heading: 'Operations',\n * subheading: 'Basic math'}\n */\nfunction isNaN_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n  convertToTensor(x, 'x', 'isNaN');\n  const inputs: IsNaNInputs = {x: $x};\n  return ENGINE.runKernel(IsNaN,\n  inputs as {} as NamedTensorMap);\n}\n\nexport const isNaN = op({isNaN_});\n", "/*\n * @license\n * Copyright
```


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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {LeakyRelu, LeakyReluAttrs, LeakyReluInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes leaky rectified linear element-wise.\n *\n * See\n * [http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf](\n * http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf)\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n * x.leakyRelu(0.1).print(); // or tf.leakyRelu(x, 0.1)\n * ```\n * @param x The input tensor.\n * @param alpha The scaling factor for negative values, defaults to 0.2.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction leakyRelu_<T extends Tensor>(x: T|TensorLike, alpha = 0.2): T {\n  const $x = convertToTensor(x, 'x', 'leakyRelu');\n  const inputs: LeakyReluInputs = {x: $x};\n  const attrs: LeakyReluAttrs = {alpha};\n  return ENGINE.runKernel(\n    LeakyRelu, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const leakyRelu = op({leakyRelu_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Less, LessInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a < b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n * a.less(b).print();\n * ```\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction less_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  let $a = convertToTensor(a, 'a', 'less');\n  let $b = convertToTensor(b, 'b', 'less');\n  [$a, $b] = makeTypesMatch($a, $b);\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  const inputs: LessInputs = {a: $a, b: $b};\n  return ENGINE.runKernel(Less, inputs as {} as NamedTensorMap);\n}\n\nexport const less = op({less_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {LessEqual, LessEqualInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth
```

```

value of (a <= b) element-wise. Supports broadcasting.\n *n * ````js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b =
tf.tensor1d([2, 2, 2]);\n *n * a.lessEqual(b).print();\n * ````\n *n * @param a The first input tensor.\n * @param b
The second input tensor. Must have the same dtype as `a`.\n *n * @doc {heading: 'Operations', subheading:
'Logical'}\n *n *function lessEqual_<T extends Tensor>(\n * a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let
$a = convertToTensor(a, 'a', 'lessEqual');\n let $b = convertToTensor(b, 'b', 'lessEqual');\n [$a, $b] =
makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs:
LessEqualInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(LessEqual, inputs as { } as
NamedTensorMap);\n}\n\nexport const lessEqual = op({lessEqual_});\n","/*\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *n *
http://www.apache.org/licenses/LICENSE-2.0\n *n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n *n *import {ENGINE} from '../engine';\n *import {LinSpace, LinSpaceAttrs} from './kernel_names';\n *import
{NamedAttrMap} from './kernel_registry';\n *import {Tensor1D} from './tensor';\n *n *n * Return an evenly spaced
sequence of numbers over the given interval.\n *n * ````js\n * tf.linspace(0, 9, 10).print();\n * ````\n *n * @param start
The start value of the sequence.\n *n * @param stop The end value of the sequence.\n *n * @param num The number of
values to generate.\n *n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *n *n *export function linspace(start:
number, stop: number, num: number): Tensor1D {\n if (num <= 0) {\n throw new Error("The number of values
should be positive.");\n }\n\n const attrs: LinSpaceAttrs = {start, stop, num};\n return
ENGINE.runKernel(LinSpace, { }, attrs as { } as NamedAttrMap);\n}\n","/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *n *
http://www.apache.org/licenses/LICENSE-2.0\n *n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n *n *import {ENGINE} from '../engine';\n *import {LRN, LRNAttrs, LRNInputs} from './kernel_names';\n *import
{NamedAttrMap} from './kernel_registry';\n *import {Tensor3D, Tensor4D} from './tensor';\n *import
{NamedTensorMap} from './tensor_types';\n *import {convertToTensor} from './tensor_util_env';\n *import
{TensorLike} from './types';\n *import * as util from './util';\n *n *import {op} from './operation';\n *import {reshape}
from './reshape';\n *n *n * Normalizes the activation of a local neighborhood across or within\n * channels.\n *n *
@param x The input tensor. The 4-D input tensor is treated as a 3-D array\n * of 1D vectors (along the last
dimension), and each vector is\n * normalized independently.\n *n * @param depthRadius The number of adjacent
channels in the 1D normalization\n * window.\n *n * @param bias A constant bias term for the basis.\n *n * @param
alpha A scale factor, usually positive.\n *n * @param beta An exponent.\n *n * @doc {heading: 'Operations',
subheading: 'Normalization'}\n *n *n *function localResponseNormalization_<T extends Tensor3D|Tensor4D>(\n * x:
T|TensorLike, depthRadius = 5, bias = 1, alpha = 1, beta = 0.5): T {\n const $x = convertToTensor(x, 'x',
'localResponseNormalization');\n util.assert(\n * $x.rank === 4 || $x.rank === 3,\n * () => `Error in
localResponseNormalization: x must be rank 3 or 4 but got\n * rank ${$x.rank}.`);\n util.assert(\n
util.isInt(depthRadius),\n * () => `Error in localResponseNormalization: depthRadius must be an ` +\n
`integer but got depthRadius ${depthRadius}.`);\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if
($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n
}\n\n const inputs: LRNInputs = {x: x4D};\n\n const attrs: LRNAttrs = {depthRadius, bias, alpha, beta};\n\n //
tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n * LRN, inputs

```

```
as { } as NamedTensorMap,\n      attrs as { } as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n  return\n  reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n } else {\n  return res;\n }\n}\n\nexport const\nlocalResponseNormalization = op({localResponseNormalization_});\n"/**\n * @license\n * Copyright 2018\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Log, LogInputs} from './kernel_names';\nimport {Tensor} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes\n * natural logarithm of the input `tf.Tensor` element-wise:  $\ln(x)$ \n *  $\text{const } x = \text{tf.tensor1d}([1, 2,\n * \text{Math.E}]);\n * x.\text{log}().\text{print}();$  // or  $\text{tf.log}(x)$ \n *  $\text{@param } x$  The input tensor.\n *  $\text{@doc}$  {heading:\n * 'Operations', subheading: 'Basic math'}\n * \nfunction log<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n  convertToTensor(x, 'x', 'log');\n  const inputs: LogInputs = {x: $x};\n  return ENGINE.runKernel(Log, inputs as { }\n  as NamedTensorMap);\n}\n\nexport const log = op({log_});\n"/**\n * @license\n * Copyright 2018 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

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=====\n*\n\nimport {ENGINE} from './engine';\nimport {Log1p, Log1pInputs} from './kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes\n * natural logarithm of the input `tf.Tensor` plus one\n * element-wise:  $\ln(1 + x)$ \n *  $\text{const } x =\n * \text{tf.tensor1d}([1, 2, \text{Math.E} - 1]);\n * x.\text{log1p}().\text{print}();$  // or  $\text{tf.log1p}(x)$ \n *  $\text{@param } x$  The input tensor.\n *  $\text{@doc}$  {heading: 'Operations', subheading: 'Basic math'}\n * \nfunction log1p<T extends Tensor>(x:\n T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'log1p');\n  const inputs: Log1pInputs = {x: $x};\n  return\n  ENGINE.runKernel(Log1p, inputs as { } as NamedTensorMap);\n}\n\nexport const log1p = op({log1p_});\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {CustomGradientFunc, ENGINE} from './engine';\nimport {Scalar, Tensor, Variable} from\n './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor, convertToTensorArray}\n from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\n/**\n * Provided\n * `f(x)`, returns another function `g(x, dy?)`, which gives the\n * gradient of `f(x)` with respect to `x`. If `dy` is\n * provided, the gradient of `f(x).mul(dy).sum()` with respect to\n * `x` is computed instead. `f(x)` must take a single\n * tensor `x` and return a\n * single tensor `y`. If `f()` takes multiple inputs, use `tf.grad` instead.\n *  $\text{//}$ \n *  $f(x) = x^2$   $\text{const } f = x \Rightarrow x.\text{square}();$ \n *  $\text{//}$   $f'(x) = 2x$   $\text{const } g = \text{tf.grad}(f);$ \n *  $\text{const } x = \text{tf.tensor1d}([2,\n * 3]);\n * g(x).\text{print}();$ \n *  $\text{//}$   $f(x) = x^3$   $\text{const } f = x \Rightarrow x.\text{pow}(\text{tf.scalar}(3, 'int32'));$ \n *  $\text{//}$   $f'(x) =$ 
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3x ^ 2\n * const g = tf.grad(f);\n * // f'(x) = 6x\n * const gg = tf.grad(g);\n *\n * const x = tf.tensor1d([2, 3]);\n *\n * gg(x).print();\n * ```\n *\n * @param f The function f(x), to compute gradient for.\n *\n * @doc {heading: 'Training',\n * subheading: 'Gradients'}\n *\n * \nfunction grad(f: (x: Tensor) => Tensor): (\n * x: TensorLike|Tensor, dy?:\n * TensorLike|Tensor) => Tensor {\n * util.assert(\n * util.isFunction(f), () => 'The f passed in grad(f) must be a\n * function');\n * return (x: TensorLike|Tensor, dy?: TensorLike|Tensor): Tensor => {\n * // x can be of any dtype, thus\n * null as the last argument.\n * const $x = convertToTensor(x, 'x', 'tf.grad', 'string_or_numeric');\n * const $dy: Tensor\n * =\n * (dy != null) ? convertToTensor(dy, 'dy', 'tf.grad') : null;\n * return ENGINE.tidy(() => {\n * const {value,\n * grads} = ENGINE.gradients(() => f($x), [$x], $dy);\n * if ($dy != null) {\n * util.assertShapesMatch(\n * value.shape, $dy.shape,\n * 'The shape of dy passed in grad(f)(x, dy) must match the shape '\n * +\n * 'returned by f(x)');\n * }\n * checkGrads(grads);\n * return grads[0];\n * });\n * });\n * }\n *\n * Provided `f(x1,\n * x2,...)`, returns another function `g([x1, x2,...], dy?)` which gives an array of gradients of `f()` with respect to\n * each input\n * `[x1, `x2`, ...]`. If `dy` is passed when calling `g()`, the gradient of\n * `f(x1,...).mul(dy).sum()`\n * with respect to each input is computed instead.\n * The provided `f` must take one or more tensors and return a\n * single tensor\n * `y`. If `f()` takes a single input, we recommend using `tf.grad` instead.\n *\n * ```\n *\n * // f(a, b) = a\n * * b\n * const f = (a, b) => a.mul(b);\n * // df / da = b, df / db = a\n * const g = tf.grads(f);\n *\n * const a =\n * tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const [da, db] = g([a, b]);\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n * ```\n *\n * @param f The function `f(x1, x2,...)` to compute\n * gradients for.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\n * \nfunction grads(f: (...args: Tensor[])\n * => Tensor): (\n * args: Array<Tensor|TensorLike>, dy?: Tensor|TensorLike) => Tensor[] {\n * util.assert(\n * util.isFunction(f), () => 'The f passed in grads(f) must be a function');\n * return (args: Array<Tensor|TensorLike>,\n * dy?: Tensor|TensorLike): Tensor[] => {\n * util.assert(\n * Array.isArray(args),\n * () => 'The args passed in\n * grads(f)(args) must be an array '\n * +\n * 'of `Tensor`s or `TensorLike`s');\n * // args can be of any dtype, thus null\n * as the last argument.\n * const $args =\n * convertToTensorArray(args, 'args', 'tf.grads', 'string_or_numeric');\n * const $dy: Tensor =\n * (dy != null) ? convertToTensor(dy, 'dy', 'tf.grads') : null;\n * return ENGINE.tidy(() =>\n * {\n * const {value, grads} = ENGINE.gradients(() => f(...$args), $args, $dy);\n * if ($dy != null) {\n * util.assertShapesMatch(\n * value.shape, $dy.shape,\n * 'The shape of dy passed in grads(f)([x1,...], dy)\n * must '\n * +\n * 'match the shape returned by f([x1,...])');\n * }\n * checkGrads(grads);\n * return grads;\n * });\n * });\n * }\n *\n * Like `tf.grad`, but also returns the value of `f()`. Useful when `f()`\n * returns a metric you\n * want to show.\n *\n * The result is a rich object with the following properties:\n * - grad: The gradient of `f(x)` w.r.t\n * `x` (result of `tf.grad`).\n * - value: The value returned by `f(x)`. \n *\n * ```\n *\n * // f(x) = x ^ 2\n * const f = x =>\n * x.square();\n * // f'(x) = 2x\n * const g = tf.valueAndGrad(f);\n *\n * const x = tf.tensor1d([2, 3]);\n * const {value,\n * grad} = g(x);\n * console.log('value');\n * value.print();\n * console.log('grad');\n * grad.print();\n * ```\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\n * \nfunction valueAndGrad<I extends Tensor, O extends\n * Tensor>(f: (x: I) => O): (\n * x: I, dy?: O) => {\n * value: O;\n * grad: I;\n * }\n *\n * util.assert(\n * util.isFunction(f),\n * () => 'The f passed in valueAndGrad(f) must be a function');\n * return (x: I, dy?: O) => {\n * util.assert(\n * x\n * instanceof Tensor,\n * () => 'The x passed in valueAndGrad(f)(x) must be a tensor');\n * util.assert(\n * dy ==\n * null || dy instanceof Tensor,\n * () => 'The dy passed in valueAndGrad(f)(x, dy) must be a tensor');\n * const\n * {grads, value} = ENGINE.gradients(() => f(x), [x], dy);\n * checkGrads(grads);\n * return {grad: grads[0] as I,\n * value};\n * });\n * }\n *\n * Like `tf.grads`, but returns also the value of `f()`. Useful when `f()`\n * returns a metric\n * you want to show.\n *\n * The result is a rich object with the following properties:\n * - grads: The gradients of `f()`\n * w.r.t each input (result of `tf.grads`).\n * - value: The value returned by `f(x)`. \n *\n * ```\n *\n * // f(a, b) = a * b\n * const f = (a, b) => a.mul(b);\n * // df/da = b, df/db = a\n * const g = tf.valueAndGrads(f);\n *\n * const a =\n * tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const {value, grads} = g([a, b]);\n *\n * const [da, db] =\n * grads;\n * console.log('value');\n * value.print();\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n * ```\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\n * \nfunction valueAndGrads<O\n * extends Tensor>(f: (...args: Tensor[]) => O): (\n * args: Tensor[], dy?: O) => {\n * grads: Tensor[];\n * value: O;\n * }\n *\n * util.assert(\n * util.isFunction(f),\n * () => 'The f passed in valueAndGrads(f) must be a function');\n * return\n * (args: Tensor[], dy?: O) => {\n * util.assert(\n * Array.isArray(args) && args.every(arg => arg instanceof

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Tensor),\n    () => 'The args passed in valueAndGrads(f)(args) must be array of ' +\n        'tensors');\n    util.assert(\n        dy == null || dy instanceof Tensor,\n        () => 'The dy passed in valueAndGrads(f)(args, dy) must\n        be a tensor');\n    const res = ENGINE.gradients(() => f(...args), args, dy);\n    if (dy != null) {\n        util.assertShapesMatch(\n            res.value.shape, dy.shape,\n            'The shape of dy passed in\n            valueAndGrads(f)([x1,...], dy) must ' +\n            'match the shape returned by f([x1,...])');\n    }\n    checkGrads(res.grads);\n    return res;\n};\n\n/**\n * Computes and returns the gradient of f(x) with respect to\n * the list of\n * trainable variables provided by `varList`. If no list is provided, it\n * defaults to all trainable\n * variables.\n *\n *`js`\n * const a = tf.variable(tf.tensor1d([3, 4]));\n * const b = tf.variable(tf.tensor1d([5, 6]));\n * const x = tf.tensor1d([1, 2]);\n * // f(a, b) = a * x ^ 2 + b * x\n * const f = () =>\n * a.mul(x.square()).add(b.mul(x)).sum();\n * // df/da = x ^ 2, df/db = x\n * const {value, grads} =\n * tf.variableGrads(f);\n * Object.keys(grads).forEach(varName => grads[varName].print());\n *```\n *\n * @param f The function to execute. f() should return a scalar.\n * @param varList The list of variables to compute\n * the gradients with respect\n * to. Defaults to all trainable variables.\n * @returns An object with the following\n * keys and values:\n * - `value`: The value of the function `f`.\n * - `grads`: A map from the names of the variables\n * to the gradients.\n * If the `varList` argument is provided explicitly and contains a subset of\n * non-trainable\n * variables, this map in the return value will contain keys\n * that map the names of the non-trainable variables to\n * `null`.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction variableGrads(f: () => Scalar,\n    varList?: Variable[]):\n    {value: Scalar, grads: NamedTensorMap} {\n    util.assert(\n        util.isFunction(f),\n        ()\n        => 'The f passed in variableGrads(f) must be a function');\n    util.assert(\n        varList == null ||\n        Array.isArray(varList) && varList.every(v => v instanceof Variable),\n        () =>\n            'The varList passed in\n            variableGrads(f, varList) must be an array ' +\n            'of variables');\n\n    const specifiedVarList = varList != null;\n    if (!specifiedVarList) {\n        // Get all of the trainable variables.\n        varList = [];\n        for (const varName in\n            ENGINE.registeredVariables) {\n            varList.push(ENGINE.registeredVariables[varName]);\n        }\n    }\n\n    const\n        specifiedNonTrainable: Variable[] =\n        specifiedVarList ? varList.filter(variable => !variable.trainable) : null;\n\n    // Prune non-trainable variables.\n    const originalVarCount = varList.length;\n    varList = varList.filter(variable =>\n        variable.trainable);\n    util.assert(\n        varList.length > 0,\n        () => `variableGrads() expects at least one of the input\n        variables to ` +\n        `be trainable, but none of the ${originalVarCount} variables is ` +\n        `trainable.`);\n\n    const allowNoGradients = true;\n    const {value, grads} = ENGINE.gradients(f, varList, null, allowNoGradients);\n\n    util.assert(\n        grads.some(g => g != null),\n        () => 'Cannot find a connection between any variable and the result\n        of ' +\n        'the loss function y=f(x). Please make sure the operations that ' +\n        'use variables are inside the\n        function f passed to minimize().');\n    util.assert(\n        value.rank === 0,\n        () => `The f passed in variableGrads(f)\n        must return a scalar, but it ` +\n        `returned a rank-${value.rank} tensor`);\n\n    const namedGrads:\n        NamedTensorMap = {};\n    varList.forEach((v, i) => {\n        if (grads[i] != null) {\n            namedGrads[v.name] =\n                grads[i];\n        }\n    });\n    if (specifiedNonTrainable != null) {\n        // If varList is explicitly provided and contains non-\n        trainable values,\n        // add them to the returned gradients with `null` values.\n        specifiedNonTrainable.forEach(v\n            => namedGrads[v.name] = null);\n    }\n    return {value, grads: namedGrads};\n}\n\n/**\n * Overrides the gradient\n * computation of a function `f`.\n *\n * Takes a function\n * `f(...inputs, save) => {value: Tensor, gradFunc: (dy,\n * saved) => Tensor[]}`\n * and returns another function `g(...inputs)` which takes the same inputs as `f`. When\n * called, `g` returns `f().value`. In backward mode, custom gradients\n * with respect to each input of `f` are computed\n * using `f().gradFunc`. The `save` function passed to `f` should be used for saving tensors needed\n * in the\n * gradient. And the `saved` passed to the `gradFunc` is a\n * `NamedTensorMap`, which contains those saved\n * tensor.\n *\n *`js`\n * const customOp = tf.customGrad((x, save) => {\n * // Save x to make sure it's available\n * later for the gradient.\n * save([x]);\n * // Override gradient of our custom x ^ 2 op to be dy * abs(x);\n * return\n * {\n * value: x.square(),\n * // Note `saved.x` which points to the `x` we saved earlier.\n * gradFunc: (dy,\n * saved) => [dy.mul(saved[0].abs())]\n * };);\n *\n * const x = tf.tensor1d([-1, -2, 3]);\n * const dx = tf.grad(x\n * => customOp(x));\n * console.log(`f(x):`);\n * customOp(x).print();\n * console.log(`f'(x):`);\n * dx.print();\n *```\n *\n * @param f The function to evaluate in forward mode, which should return\n * `{value: Tensor,\n * gradFunc: (dy, saved) => Tensor[]}`, where `gradFunc` returns the custom gradients of `f` with respect to its

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inputs.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n *\nfunction customGrad<T extends
Tensor>(f: CustomGradientFunc<T>):\n (...args: Tensor[]) => T {\n return
ENGINE.customGrad(f);\n}\n\nfunction checkGrads(grads: Tensor[]) {\n const numNullGradients = grads.filter(g
=> g == null).length;\n if (numNullGradients > 0) {\n throw new Error(\n `Cannot compute gradient of
y=f(x) with respect to x. Make sure that\n the f you passed encloses all operations that lead from x to y.`);\n
}\n}\n\nexport {\n customGrad,\n variableGrads,\n valueAndGrad,\n valueAndGrads,\n grad,\n
grads,\n};\n"}\n\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Neg, NegInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n**\n * Computes `1
 * x` element-wise.\n *\n * ```js\n * const x = tf.tensor2d([1, 2, -2, 0], [2, 2]);\n *\n * x.neg().print(); // or tf.neg(x)\n
*\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n
*\nfunction neg_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'neg');\n\n const
inputs: NegInputs = {x: $x};\n return ENGINE.runKernel(Neg, inputs as {} as NamedTensorMap);\n}\n\nexport
const neg = op({neg_});\n"}\n\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Softplus, SoftplusInputs} from './kernel_names';\nimport
 {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n**\n * Computes
softplus of the input `tf.Tensor` element-wise: `log(exp(x) + 1)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1,
.7]);\n *\n * x.softplus().print(); // or tf.softplus(x)\n *\n *\n * @param x The input tensor.\n *\n * @doc {heading:
'Operations', subheading: 'Basic math'}\n *\nfunction softplus_<T extends Tensor>(x: T|TensorLike): T {\n const
$x = convertToTensor(x, 'x', 'softplus');\n\n const inputs: SoftplusInputs = {x: $x};\n return
ENGINE.runKernel(Softplus, inputs as {} as NamedTensorMap);\n}\n\nexport const softplus =
op({softplus_});\n"}\n\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
```

```
=====\n
*\n\nimport {customGrad} from './gradients';\nimport {Tensor} from './tensor';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {mul} from './mul';\nimport {neg} from
 './neg';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport {softplus} from
```



```

from.\n * @param b The second `tf.Tensor` to be subtracted. Must have the same dtype as\n * `a`.\n * @doc
{heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction sub_<T extends Tensor>(a: Tensor|TensorLike, b:
Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'sub');\n let $b = convertToTensor(b, 'b', 'sub');\n [$a,
$b] = makeTypesMatch($a, $b);\n\n const inputs: SubInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Sub,
inputs as { } as NamedTensorMap);\n}\n\nexport const sub = op({sub_});\n"/**\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\nimport {ENGINE} from './engine';\nimport {Sum, SumAttrs, SumInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes the sum of elements
across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless
`keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true,
the reduced dimensions are retained with\n * length 1. If axes has no entries, all dimensions are reduced, and a\n *
`tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.sum().print();
// or tf.sum(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n *
x.sum(axis).print(); // or tf.sum(x, axis)\n * ```\n *\n * @param x The input tensor to compute the sum over. If the
dtype is `bool`\n * it will be converted to `int32` and the output dtype will be `int32`.\n * @param axis The
dimension(s) to reduce. By default it reduces\n * all dimensions.\n * @param keepDims If true, retains reduced
dimensions with size 1.\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n *\nfunction sum_<T
extends Tensor>(x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n let $x =
convertToTensor(x, 'x', 'sum');\n if ($x.dtype === 'bool') {\n $x = cast($x, 'int32');\n }\n\n const inputs:
SumInputs = {x: $x};\n const attrs: SumAttrs = {axis, keepDims};\n\n return ENGINE.runKernel(\n Sum,
inputs as { } as NamedTensorMap, attrs as { } as NamedAttrMap);\n}\n\nexport const sum = op({sum_});\n"/**\n *
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the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {customGrad} from './gradients';\nimport {Tensor} from './tensor';\nimport {GradSaveFunc} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\nimport {cast} from './cast';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max} from
 './max';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sub} from './sub';\nimport {sum}
 from './sum';\n\n/**\n * Computes the log softmax.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * a.logSoftmax().print(); // or tf.logSoftmax(a)\n * ```\n *\n * ```js\n * const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n *
a.logSoftmax().print(); // or tf.logSoftmax(a)\n * ```\n *\n * @param logits The logits array.\n * @param axis
The dimension softmax would be performed on. Defaults to -1\n * which indicates the last dimension.\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n *\nfunction logSoftmax_<T extends Tensor>(logits:
T|TensorLike, axis = -1): T {\n const $logits = convertToTensor(logits, 'logits', 'logSoftmax');\n\n if (axis === -1)
{\n axis = $logits.rank - 1;\n }\n\n if (axis !== $logits.rank - 1) {\n throw Error(\n 'Log Softmax along a non-
last dimension is not yet supported. ' +\n `Logits was rank ${$logits.rank} and axis was ${axis}`);\n }\n\n //

```



```

const forward: ForwardFunc<Tensor> = (backend, save) => {
  \n // const keepDims = true;\n // const xMax =
  max(logits, axis, true);\n // const shifted = sub(logits, xMax);\n // const value =\n // sub(cast(shifted,
  'float32'), log(sum(exp(shifted), axis,\n // keepDims));\n // save([value]);\n // return value;\n // };\n\n //
  Use a custom gradient for numerical stability.\n const customOp = customGrad((logits: Tensor, save:
  GradSaveFunc) => {\n const keepDims = true;\n const xMax = max(logits, axis, true);\n const shifted =
  sub(logits, xMax);\n const value =\n sub(cast(shifted, 'float32'), log(sum(exp(shifted), axis, keepDims));\n
  save([value]);\n\n const gradFunc = (dy: Tensor, saved: Tensor[]) => {\n const [value] = saved;\n const
  keepDims = true;\n const softmax = exp(value);\n return sub(dy, mul(sum(dy, axis, keepDims), softmax));\n
  });\n return {value, gradFunc};\n });\n\n return customOp($logits) as T;\n\n // TODO Use Engine.runKernel
  when CPU/WebGL/WASM backends implement this.\n // const inputs: LogSoftmaxInputs = {logits: $logits};\n //
  const attrs: LogSoftmaxAttrs = {axis};\n // return ENGINE.runKernel(\n // LogSoftmax, inputs as { } as
  NamedTensorMap,\n // attrs as { } as NamedAttrMap);\n\n\n\nexport const logSoftmax =
  op({logSoftmax_});\n\n",/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed
  under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *
  =====\n
  *\n\nimport * as util from './util';\n\n/**\n * Returns true if the axis specifies the inner most dimensions of the\n *
  array.\n *\nexport function axesAreInnerMostDims(axes: number[], rank: number): boolean {\n for (let i = 0; i <
  axes.length; ++i) {\n if (axes[axes.length - i - 1] !== rank - 1 - i) {\n return false;\n }\n }\n return
  true;\n}\n\nexport function combineLocations(\n outputLoc: number[], reduceLoc: number[], axes: number[]):
  number[] {\n const rank = outputLoc.length + reduceLoc.length;\n const loc = [];\n let outIdx = 0;\n let reduceIdx
  = 0;\n for (let dim = 0; dim < rank; dim++) {\n if (axes.indexOf(dim) === -1) {\n
  loc.push(outputLoc[outIdx++]);\n } else {\n loc.push(reduceLoc[reduceIdx++]);\n }\n }\n return
  loc;\n}\n\nexport function computeOutAndReduceShapes(\n aShape: number[], axes: number[]): [number[],
  number[]] {\n const outShape = [];\n const rank = aShape.length;\n for (let dim = 0; dim < rank; dim++) {\n if
  (axes.indexOf(dim) === -1) {\n outShape.push(aShape[dim]);\n }\n }\n const reduceShape = axes.map(dim
  => aShape[dim]);\n return [outShape, reduceShape];\n}\n\nexport function expandShapeToKeepDim(\n shape:
  number[], axes: number[]): number[] {\n const reduceSubShape = axes.map(x => 1);\n return
  combineLocations(shape, reduceSubShape, axes);\n}\n\nexport function assertAxesAreInnerMostDims(\n msg:
  string, axes: number[], rank: number): void {\n util.assert(\n axesAreInnerMostDims(axes, rank),\n () =>
  `${msg} supports only inner-most axes for now. ` +\n `Got axes ${axes} and rank-${rank}
  input.`);\n}\n\n/**\n * Returns the axes permutation to be used with `tf.transpose`, if such\n * permutation is
  necessary. Otherwise it returns null. This method is used by\n * operations that operate only on inner-most axes.\n
  *\nexport function getAxesPermutation(axes: number[], rank: number): number[] | null {\n if
  (axesAreInnerMostDims(axes, rank)) {\n return null;\n }\n const result: number[] = [];\n for (let i = 0; i < rank;
  ++i) {\n if (axes.indexOf(i) === -1) {\n result.push(i);\n }\n }\n axes.forEach(axis => result.push(axis));\n
  return result;\n}\n\n/**\n * Returns the axes permutation that undoes the original permutation. *\nexport function
  getUndoAxesPermutation(axes: number[]): number[] {\n return axes.map((axis, i) => [i, axis])\n .sort((a, b) =>
  a[1] - b[1])\n .map(x => x[0]);\n}\n\nexport function getInnerMostAxes(numAxes: number, rank: number):
  number[] {\n const res: number[] = [];\n for (let i = rank - numAxes; i < rank; ++i) {\n res.push(i);\n }\n
  return
  res;\n}\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
  License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {parseAxisParam} from './util';\nimport {add} from './add';\nimport {expandShapeToKeepDim} from './axis_util';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max} from './max';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\n/**\n * Computes the log(sum(exp(elements across the reduction dimensions)).\n *\n * Reduces the input along the dimensions given in `axis`. Unless `keepDims` is true, the rank of the array is reduced by 1 for each entry in `axis`. If `keepDims` is true, the reduced dimensions are retained with length 1.\n *\n * If `axis` has no entries, all dimensions are reduced, and an array with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.logSumExp().print(); // or tf.logSumExp(x)\n *\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n * x.logSumExp(axis).print(); // or tf.logSumExp(a, axis)\n *\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. If null (the default), reduces all dimensions.\n * @param keepDims If true, retains reduced dimensions with length of 1. Defaults to false.\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction logSumExp<T extends Tensor>(\n  x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n  const $x = convertToTensor(x, 'x', 'logSumExp');\n  const axes = parseAxisParam(axis, $x.shape);\n  const xMax = max($x, axes, true /* keepDims */);\n  const a = sub($x, xMax);\n  const b = exp(a);\n  const c = sum(b, axes);\n  const d = log(c);\n  const res = add(reshape(xMax, d.shape), d);\n  if (keepDims) {\n    const newShape = expandShapeToKeepDim(res.shape, axes);\n    return reshape(res, newShape) as T;\n  }\n  return res as T;\n}\n\nexport const logSumExp = op({logSumExp_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

```
=====\n\n*\n\nimport {ENGINE} from './engine';\nimport {LogicalAnd, LogicalAndInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of `a AND b` element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n * a.logicalAnd(b).print();\n *\n * ```\n *\n * @param a The first input tensor. Must be of dtype bool.\n * @param b The second input tensor. Must be of dtype bool.\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalAnd<T extends Tensor>(\n  a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n  const $a = convertToTensor(a, 'a', 'logicalAnd', 'bool');\n  const $b = convertToTensor(b, 'b', 'logicalAnd', 'bool');\n  assertAndGetBroadcastShape($a.shape, $b.shape);\n  const inputs: LogicalAndInputs = {a: $a, b: $b};\n  return ENGINE.runKernel(LogicalAnd, inputs as { } as NamedTensorMap);\n}\n\nexport const logicalAnd = op({logicalAnd_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

```

*\n\nimport {ENGINE} from './engine';\nimport {LogicalNot, LogicalNotInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the
truth value of `NOT x` element-wise.\n * \n * ```js\n * const a = tf.tensor1d([false, true], 'bool');\n * \n *
a.logicalNot().print();\n * ```\n * \n * @param x The input tensor. Must be of dtype 'bool'.\n * \n * @doc {heading:
'Operations', subheading: 'Logical'}\n *\nfunction logicalNot_<T extends Tensor>(x: T|TensorLike): T {\n const
$x = convertToTensor(x, 'x', 'logicalNot', 'bool');\n const inputs: LogicalNotInputs = {x: $x};\n return
ENGINE.runKernel(LogicalNot, inputs as {} as NamedTensorMap);\n}\n\nexport const logicalNot =
op({logicalNot_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {LogicalOr, LogicalOrInputs} from './kernel_names';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from
 './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of `a OR b` element-wise.
Supports broadcasting.\n * \n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b =
tf.tensor1d([false, true, false, true], 'bool');\n * \n * a.logicalOr(b).print();\n * ```\n * \n * @param a The first input tensor.
Must be of dtype bool.\n * \n * @param b The second input tensor. Must be of dtype bool.\n * \n * @doc {heading:
'Operations', subheading: 'Logical'}\n *\nfunction logicalOr_<T extends Tensor>(\n  a: Tensor|TensorLike, b:
Tensor|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'logicalOr', 'bool');\n const $b = convertToTensor(b,
'b', 'logicalOr', 'bool');\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: LogicalOrInputs = {a:
$a, b: $b};\n return ENGINE.runKernel(LogicalOr, inputs as {} as NamedTensorMap);\n}\n\nexport const logicalOr
= op({logicalOr_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {logicalAnd} from
 './logical_and';\nimport {logicalNot} from './logical_not';\nimport {logicalOr} from './logical_or';\nimport {op} from
 './operation';\n\n/**\n * Returns the truth value of `a XOR b` element-wise. Supports broadcasting.\n * \n *
```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n * \n *
a.logicalXor(b).print();\n * ```\n * \n * @param a The first input tensor. Must be of dtype bool.\n * \n * @param b The
second input tensor. Must be of dtype bool.\n * \n * @doc {heading: 'Operations', subheading: 'Logical'}\n *\nfunction logicalXor_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n const $a =
convertToTensor(a, 'a', 'logicalXor', 'bool');\n const $b = convertToTensor(b, 'b', 'logicalXor', 'bool');\n
assertAndGetBroadcastShape($a.shape, $b.shape);\n\n // x ^ y = (x | y) & ~(x & y)\n return
logicalAnd(logicalOr(a, b), logicalNot(logicalAnd(a, b)));\n}\n\nexport const logicalXor =
op({logicalXor_});\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the

```

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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {MaxPool, MaxPoolAttrs, MaxPoolInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 2D max pooling of an image.\n * @param x The input tensor, of rank 4 or rank 3 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight, filterWidth]`. If\n * `filterSize` is a single number, then `filterHeight == filterWidth`.\n * @param strides The strides of the pooling: `[strideHeight, strideWidth]`. If\n * `strides` is a single number, then `strideHeight == strideWidth`.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and width dimensions\n * in dilated pooling. Defaults to `[1, 1]`. If `dilations` is a single\n * number, then `dilationHeight == dilationWidth`. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n */\nfunction maxPool<T>(x: T|TensorLike, filterSize: [number, number]|number,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'maxPool');\n const dilations = 1;\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if ($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n util.assert(x4D.rank === 4, () => `Error in maxPool: input must be rank 4 but got rank ${x4D.rank}`);\n util.assert(conv_util.eitherStridesOrDilationsAreOne(strides, dilations), () => `Error in maxPool: Either strides or dilations must be 1.`);\n const {strides, dilations} = conv_util.getStridesAndDilations(\n filterSize, dilations, dimRoundingMode);\n if (dimRoundingMode != null) {\n util.assert(util.isInt(pad as number), () => `Error in maxPool: pad must be an integer when using, `);\n }\n const inputs: MaxPoolInputs = {x: x4D};\n const attrs: MaxPoolAttrs = {filterSize, strides, pad, dimRoundingMode};\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(MaxPool, inputs as {}, attrs as {} as NamedAttrMap) as T;\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const maxPool = op({maxPool});\n\n**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor4D, Tensor5D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport * as util from './util';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 3D max pooling of an image.\n * @param x The input tensor, of rank 5 or rank 4 of shape\n * `[batch, height, width, depth, inChannels]`. If rank 4, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight, filterWidth, filterDepth]`. If\n * `filterSize` is a single number, then `filterHeight == filterWidth == filterDepth`.\n * @param strides The strides of the pooling: `[strideHeight, strideWidth, strideDepth]`. If\n * `strides` is a single number, then `strideHeight == strideWidth == strideDepth`.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth, dilationDepth]`\n * in which we sample input values across the height, width and depth dimensions\n * in dilated pooling. Defaults to `[1, 1, 1]`. If `dilations` is a single\n * number, then `dilationHeight == dilationWidth == dilationDepth`. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution3D](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution3D)\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n */\nfunction maxPool3D<T>(x: T|TensorLike, filterSize: [number, number, number]|number,\n strides: [number, number, number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'maxPool3D');\n const dilations = 1;\n let x5D = $x as Tensor5D;\n let reshapedTo5D = false;\n if ($x.rank === 4) {\n reshapedTo5D = true;\n x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2], $x.shape[3]]);\n }\n util.assert(x5D.rank === 5, () => `Error in maxPool3D: input must be rank 5 but got rank ${x5D.rank}`);\n util.assert(conv_util.eitherStridesOrDilationsAreOne(strides, dilations), () => `Error in maxPool3D: Either strides or dilations must be 1.`);\n const {strides, dilations} = conv_util.getStridesAndDilations(\n filterSize, dilations, dimRoundingMode);\n if (dimRoundingMode != null) {\n util.assert(util.isInt(pad as number), () => `Error in maxPool3D: pad must be an integer when using, `);\n }\n const inputs: MaxPool3DInputs = {x: x5D};\n const attrs: MaxPool3DAttrs = {filterSize, strides, pad, dimRoundingMode};\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(MaxPool3D, inputs as {}, attrs as {} as NamedAttrMap) as T;\n if (reshapedTo5D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as T;\n }\n return res;\n}\n\nexport const maxPool3D = op({maxPool3D});\n\n**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```



inChannels]. If rank 3, batch of 1 is assumed.

`@param filterSize` The filter size: `[filterHeight, filterWidth]`. If `filterSize` is a single number, then `filterHeight == filterWidth`.

`@param strides` The strides of the pooling: `[strideHeight, strideWidth]`. If `strides` is a single number, then `strideHeight == strideWidth`.

`@param dataFormat` An optional string from: `"NDHWC"`, `"NCDHW"`. Defaults to `"NDHWC"`. Specify the data format of the input and output data. With the default format `"NDHWC"`, the data is stored in the order of: `[batch, depth, height, width, channels]`. Only `"NDHWC"` is currently supported.

`@param pad` The type of padding algorithm. `same` and stride 1: output will be of same size as input, regardless of filter size. `valid`: output will be smaller than input if filter is larger than `1x1`.

- For more info, see this guide: [https://www.tensorflow.org/api\\_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution)

`@param includeBatchIndex` Defaults to `False`. Whether to include batch dimension in flattened index of `argmax`.

`@doc {heading: 'Operations', subheading: 'Convolution'}`

```

def maxPoolWithArgmax_<T extends Tensor4D>(x: T|TensorLike,
 filterSize: [number, number]|number,
 strides: [number, number]|number,
 pad: 'valid'|'same'|number,
 includeBatchInIndex = false): NamedTensorMap {
 const $x = convertToTensor(x, 'x',
 'maxPoolWithArgmax');
 const inputs: MaxPoolWithArgmaxInputs = {x: $x};
 const attrs: MaxPoolWithArgmaxAttrs = {filterSize, strides, pad, includeBatchInIndex};
 // tslint:disable-next-line: no-unnecessary-type-assertion
 const result = ENGINE.runKernel(MaxPoolWithArgmax, inputs as { } as NamedTensorMap,
 attrs as { } as NamedAttrMap) as Tensor[];
 return {result: result[0], indexes: result[1]};
}
export const maxPoolWithArgmax = op({maxPoolWithArgmax_});

```

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```

=====
import {ENGINE} from '../engine';
import {Maximum, MaximumInputs} from '../kernel_names';
import {Tensor} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {makeTypesMatch} from '../tensor_util';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from '../types';
import {assertAndGetBroadcastShape} from '../broadcast_util';
import {cast} from '../cast';
import {op} from '../operation';

```

`max` Returns the max of `a` and `b` (`a > b ? a : b`) element-wise. Supports broadcasting. We also expose `tf.maximumStrict` which has the same signature as this op and asserts that `a` and `b` are the same shape (does not broadcast).

```

const a = tf.tensor1d([1, 4, 3, 16]);
const b = tf.tensor1d([1, 2, 9, 4]);
a.maximum(b).print(); // or tf.maximum(a, b)

```

`Broadcast maximum a with b`

```

const a = tf.tensor1d([2, 4, 6, 8]);
const b = tf.scalar(5);
a.maximum(b).print(); // or tf.maximum(a, b)

```

`@param a` The first tensor. `@param b` The second tensor. Must have the same type as `a`.

`@doc {heading: 'Operations', subheading: 'Arithmetic'}`

```

function maximum_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {
 let $a = convertToTensor(a, 'a', 'maximum');
 let $b = convertToTensor(b, 'b', 'maximum');
 [$a, $b] = makeTypesMatch($a, $b);
 if ($a.dtype === 'bool') {
 $a = cast($a, 'int32');
 $b = cast($b, 'int32');
 }
 assertAndGetBroadcastShape($a.shape, $b.shape);
 const inputs: MaximumInputs = {a: $a, b: $b};
 return ENGINE.runKernel(Maximum, inputs as { } as NamedTensorMap);
}
export const maximum = op({maximum_});

```

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```

=====
*\n
*\nimport {ENGINE} from './engine';\nimport {Mean, MeanAttrs, MeanInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the mean of elements across dimensions of a
`tf.Tensor`.\n * Reduces `x` along the dimensions given in `axis`. Unless `keepDims` is\n * true, the rank of the
`tf.Tensor` is reduced by 1 for each entry in `axis`.\n * If `keepDims` is true, the reduced dimensions are retained
with length 1.\n * If `axis` has no entries, all dimensions are reduced, and a `tf.Tensor` with\n * a single element is
returned.\n *
```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.mean().print(); // or tf.mean(a)\n *
```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n * x.mean(axis).print(); // or tf.mean(x,
axis)\n *
`@param x` The input tensor.\n * `@param axis` The dimension(s) to reduce. By default it
reduces\n * all dimensions.\n * `@param keepDims` If true, retains reduced dimensions with size 1.\n *
`@doc {heading: 'Operations', subheading: 'Reduction'}\n
*\nfunction mean_<T extends Tensor>(\n x:
Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x',
'mean');\n\n const inputs: MeanInputs = {x: $x};\n const attrs: MeanAttrs = {axis, keepDims};\n\n return
ENGINE.runKernel(\n Mean, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n\n}\n\nexport
const mean = op({mean_});\n", "/*\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====

```

```

=====
*\n
*\nimport {ENGINE} from './engine';\nimport {Min, MinAttrs, MinInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Computes the minimum value from the input.\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the array is
reduced by 1 for each entry in `axes`.\n * If `keepDims` is true, the reduced dimensions are retained with length 1.\n *
If `axes` has no entries, all dimensions are reduced, and an array with a\n * single element is returned.\n *
```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.min().print(); // or tf.min(x)\n *
```js\n * const x =
tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n * x.min(axis).print(); // or tf.min(x, axis)\n *
`@param x` The input Tensor.\n * `@param axis` The dimension(s) to reduce. By default it reduces\n * all
dimensions.\n * `@param keepDims` If true, retains reduced dimensions with size 1.\n *
`@doc {heading: 'Operations', subheading: 'Reduction'}\n
*\nfunction min_<T extends Tensor>(\n x: Tensor|TensorLike, axis:
number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'min');\n\n const inputs:
MinInputs = {x: $x};\n const attrs: MinAttrs = {axis, keepDims};\n\n // tslint:disable-next-line: no-unnecessary-
type-assertion\n return ENGINE.runKernel(\n Min, inputs as {} as NamedTensorMap,\n attrs as { }
as NamedAttrMap) as T;\n\n}\n\nexport const min = op({min_});\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====

```

```

=====
*\n
*\nimport {ENGINE} from './engine';\nimport {Minimum, MinimumInputs} from './kernel_names';\nimport

```

```

{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
 {assertAndGetBroadcastShape} from './broadcast_util';\nimport {cast} from './cast';\nimport {op} from
 './operation';\n\n/**\n * Returns the min of a and b ($a < b ? a : b$) element-wise.\n * Supports broadcasting.\n *\n * We also expose `minimumStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the
 same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2,
 9, 4]);\n * a.minimum(b).print(); // or tf.minimum(a, b)\n * ```\n *\n * // Broadcast minimum a with
 b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n * a.minimum(b).print(); // or tf.minimum(a,
 b)\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n *
 @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction minimum_<T extends Tensor>(\n a:
 Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'minimum');\n let $b =
 convertToTensor(b, 'b', 'minimum');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'bool') {\n $a =
 cast($a, 'int32');\n $b = cast($b, 'int32');\n }\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const
 inputs: MinimumInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Minimum, inputs as { }) as
 NamedTensorMap);\n}\n\nexport const minimum = op({minimum_});\n", "/*\n * @license\n * Copyright 2020
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
 may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
 software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {ENGINE} from './engine';\nimport {MirrorPad, MirrorPadAttrs, MirrorPadInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
 {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\n\n/**\n * Pads a
 `tf.Tensor` using mirror padding.\n *\n * This operation implements the `REFLECT` and `SYMMETRIC` modes of
 pad.\n *\n * ```js\n * const x = tf.range(0, 9).reshape([1, 1, 3, 3]);\n * x.mirrorPad([[0, 0], [0, 0], [2, 2], [2, 2]],
 'reflect').print();\n * ```\n *\n * @param x The tensor to pad.\n * @param paddings An array of length `R` (the rank of
 the tensor), where\n * each element is a length-2 tuple of ints `[padBefore, padAfter]`,\n * specifying how much to
 pad along each dimension of the tensor.\n *\n * In "reflect" mode, the padded regions do not include the borders,\n *
 while in "symmetric" mode the padded regions do include the borders.\n *\n * For example, if the input is `[1, 2, 3]`
 and paddings is `[0, 2]`,\n * then the output is `[1, 2, 3, 2, 1]` in "reflect" mode, and\n * `[1, 2, 3, 3, 2]` in
 "symmetric" mode.\n *\n * If `mode` is "reflect" then both `paddings[D, 0]` and `paddings[D, 1]`\n * must be no
 greater than `x.shape[D] - 1`. If mode is "symmetric"\n * then both `paddings[D, 0]` and `paddings[D, 1]` must be
 no greater than\n * `x.shape[D]`\n * @param mode String to specify padding mode. Can be `reflect` | `symmetric`\n
*\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction mirrorPad_<T extends Tensor>(\n
 x: T|TensorLike, paddings: Array<number, number>,\n mode: 'reflect'|'symmetric'): T {\n util.assert(\n mode
 === 'reflect' || mode === 'symmetric',\n () => `Invalid mode. Mode must be either reflect or symmetric.` +\n
`Got ${mode}.`);\n\n const $x = convertToTensor(x, 'x', 'mirrorPad');\n if ($x.rank === 0) {\n throw new Error(\n
 'mirrorPad(scalar) is not defined. ' +\n 'Pass non-scalar to mirrorPad');\n }\n util.assert(\n
 paddings.length === $x.rank,\n () => `Padding doesn't match input. Must be ${$x.rank}.` +\n `Got
 ${paddings.length}.`);\n\n const shapeOffset = mode === 'reflect' ? 1 : 0;\n for (let i = 0; i < $x.rank; i++) {\n
 util.assert(\n paddings[i].length === 2,\n () => `Invalid number of paddings. Must be length of 2 each.`);\n
 util.assert(\n paddings[i][0] >= 0 && paddings[i][0] <= $x.shape[i] - shapeOffset &&\n paddings[i][1]
 >= 0 && paddings[i][1] <= $x.shape[i] - shapeOffset,\n () => `Padding in dimension ${i} cannot be greater
 than or equal ` +\n `to ${$x.shape[i] - shapeOffset} or less than 0 for input of ` +\n `shape
 ${$x.shape}`);\n }\n\n const attrs: MirrorPadAttrs = {paddings, mode};\n const inputs: MirrorPadInputs = {x:

```



```

$X};\n return ENGINE.runKernel(\n MirrorPad, inputs as { } as NamedTensorMap, attrs as { } as
NamedAttrMap);\n}\n\nexport const mirrorPad = op({mirrorPad_});\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {ENGINE} from '../engine';\nimport {Mod, ModInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {makeTypesMatch} from
 './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport
{op} from './operation';\n\n/**\n * Returns the mod of a and b element-wise.\n * `floor(x / y) * y + mod(x, y) = x`\n
 * Supports broadcasting.\n * We also expose `tf.modStrict` which has the same signature as this op and\n
 * asserts that `a` and `b` are the same shape (does not broadcast).\n *`js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n
 * const b = tf.tensor1d([1, 2, 9, 4]);\n * a.mod(b).print(); // or tf.mod(a, b)\n *`js\n * // Broadcast a
mod b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n * a.mod(b).print(); // or tf.mod(a, b)\n
 *`js\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *
*\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n *\nfunction mod_<T extends Tensor>(a:
Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'mod');\n let $b =
convertToTensor(b, 'b', 'mod');\n [$a, $b] = makeTypesMatch($a, $b);\n const inputs: ModInputs = {a: $a, b:
$b};\n return ENGINE.runKernel(Mod, inputs as { } as NamedTensorMap);\n}\n\nexport const mod =
op({mod_});\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from './tensor';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
square of `x` element-wise: `x ^ 2`\n *`js\n * const x = tf.tensor1d([1, 2, Math.sqrt(2), -1]);\n * x.square().print(); // or tf.square(x)\n
 *`js\n * @param x The input Tensor.\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n *\nfunction square_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'square');\n const attrs = {};\n return ENGINE.runKernel('Square', {x: $x},
attrs);\n}\n\nexport const square = op({square_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport {parseAxisParam} from './util';\nimport {expandShapeToKeepDim} from
 './axis_util';\nimport {cast} from './cast';\nimport {mean} from './mean';\nimport {op} from './operation';\nimport
{reshape} from './reshape';\nimport {square} from './square';\nimport {sub} from './sub';\n\n/**\n * Calculates the

```

mean and variance of `x`. The mean and variance are calculated by aggregating the contents of `x` across `axes`. If `x` is 1-D and `axes = [0]` this is just the mean and variance of a vector.

**@param x** The input tensor.

**@param axis** The dimension(s) along with to compute mean and variance. By default it reduces all dimensions.

**@param keepDims** If true, the moments have the same dimensionality as the input.

**@return** An object with two keys: `mean` and `variance`.

**@doc {heading: 'Operations', subheading: 'Normalization'}**

```
function moments_(x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): {mean: Tensor, variance: Tensor} {
 x = convertToTensor(x, 'x', 'moments');
 const axes = parseAxisParam(axis, x.shape);
 const xMean = mean(x, axes, keepDims);
 let keepDimsShape = xMean.shape;
 if (!keepDims) {
 keepDimsShape = expandShapeToKeepDim(xMean.shape, axes);
 }
 const devSquared = square(sub(cast(x, 'float32'), reshape(xMean, keepDimsShape)));
 const variance = mean(devSquared, axes, keepDims);
 return {mean: xMean, variance};
}
```

**export const moments = op({moments\_});**

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```
=====
*import {Tensor2D} from './tensor';
import {convertToTensor, convertToTensorArray} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';
** @docalias (data: Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D]
export type LSTMCellFunc = (data: Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D];
** Computes the next states and outputs of a stack of LSTMCells.
** Each cell output is used as input to the next cell.
** Returns [cellState, cellOutput]
** Derived from tf.contrib.rnn.MultiRNNCell.
** @param lstmCells Array of LSTMCell functions.
** @param data The input to the cell.
** @param c Array of previous cell states.
** @param h Array of previous cell outputs.
** @doc {heading: 'Operations', subheading: 'RNN'}
function multiRNNCell_(lstmCells: LSTMCellFunc[], data: Tensor2D|TensorLike, c: Array<Tensor2D|TensorLike>, h: Array<Tensor2D|TensorLike>): [Tensor2D[], Tensor2D[]] {
 const $data = convertToTensor(data, 'data', 'multiRNNCell');
 const $c = convertToTensorArray(c, 'c', 'multiRNNCell');
 const $h = convertToTensorArray(h, 'h', 'multiRNNCell');
 let input = $data;
 const newStates = [];
 for (let i = 0; i < lstmCells.length; i++) {
 const output = lstmCells[i](input, $c[i], $h[i]);
 newStates.push(output[0]);
 newStates.push(output[1]);
 input = output[1];
 }
 const newC: Tensor2D[] = [];
 const newH: Tensor2D[] = [];
 for (let i = 0; i < newStates.length; i += 2) {
 newC.push(newStates[i]);
 newH.push(newStates[i + 1]);
 }
 return [newC, newH];
}
export const multiRNNCell = op({multiRNNCell_});
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** WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
** See the License for the specific language governing permissions and
** limitations under the License.
=====
```

```
=====
*import {ENGINE} from './engine';
import {Multinomial, MultinomialAttrs, MultinomialInputs} from './kernel_names';
import {NamedAttrMap} from './kernel_registry';
import {Tensor1D, Tensor2D} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';
import {reshape} from './reshape';
** Creates a `tf.Tensor` with values drawn from a multinomial distribution.
** `js` const probs = tf.tensor([.75, .25]);
** tf.multinomial(probs, 3).print();
** @param logits 1D array with
```

```

unnormalized log-probabilities, or\n * 2D array of shape `[batchSize, numOutcomes]`. See the `normalized`\n *
parameter.\n * @param numSamples Number of samples to draw for each row slice.\n * @param seed The seed
number.\n * @param normalized Whether the provided `logits` are normalized true\n * probabilities (sum to 1).
Defaults to false.\n * @return 1D array of shape `[numSamples]`, or 2D array of shape\n * `[batchSize,
numSamples]`, depending on the rank of the input.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n
*\nfunction multinomial_(\n logits: Tensor1D|Tensor2D|TensorLike, numSamples: number, seed?: number,\n normalized = false): Tensor1D|Tensor2D {\n const $logits = convertToTensor(logits, 'logits', 'multinomial');\n
 const numOutcomes = $logits.size;\n const origRank = $logits.rank;\n if (numOutcomes < 2) {\n throw new
Error(\n `Error in multinomial: you need at least 2 outcomes, but got ` +\n `${numOutcomes}.`);\n }\n if
(origRank > 2) {\n throw new Error(`Rank of probabilities must be 1 or 2, but is ${origRank}`);\n }\n //
TODO(lina128): Investigate correct seed behavior. The code seems not allow\n // setting see to 0.\n seed = seed ||
Math.random();\n // The kernel only accepts (and returns) rank 2 tensors.\n const logits2D: Tensor2D =\n origRank === 1 ? reshape($logits, [1, -1]) : $logits as Tensor2D;\n const inputs: MultinomialInputs = {logits:
logits2D};\n const attrs: MultinomialAttrs = {numSamples, seed, normalized};\n // tslint:disable-next-line: no-
unnecessary-type-assertion\n const res = ENGINE.runKernel(\n Multinomial, inputs as {} as
NamedTensorMap,\n attrs as {} as NamedAttrMap) as Tensor2D;\n // tslint:disable-next-line: no-
unnecessary-type-assertion\n return origRank === 1 ? reshape(res, [res.size]) as Tensor1D : res;\n }\n\nexport const
multinomial = op({multinomial_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\nimport {ENGINE} from '../engine';\nimport {NotEqual, NotEqualInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from
 '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth
value of (a != b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b =
tf.tensor1d([0, 2, 3]);\n * a.notEqual(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The
second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n
*\nfunction notEqual_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a =
convertToTensor(a, 'a', 'notEqual');\n let $b = convertToTensor(b, 'b', 'notEqual');\n [$a, $b] =
makeTypesMatch($a, $b);\n assertAndGetBroadcastShape($a.shape, $b.shape);\n const inputs: NotEqualInputs
= {a: $a, b: $b};\n return ENGINE.runKernel(NotEqual, inputs as {} as NamedTensorMap);\n }\n\nexport const
notEqual = op({notEqual_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an `AS IS` BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap}
from '../types';\nimport {makeZerosTypedArray, sizeFromShape} from '../util';\n\nimport {complex} from
 '../complex';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 0.\n *\n * ```js\n * tf.zeros([2, 2]).print();\n *
``` \n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an

```

element in the resulting tensor. Can be 'float32', 'int32' or 'bool'. Defaults to 'float'.
@doc {heading: 'Tensors', subheading: 'Creation'}
export function zeros<R extends Rank>(shape: ShapeMap[R], dtype: DataType = 'float32'): Tensor<R> {\n if (dtype === 'complex64') {\n const real = zeros(shape, 'float32');\n const imag = zeros(shape, 'float32');\n return complex(real, imag);\n }\n const values = makeZerosTypedArray(sizeFromShape(shape), dtype);\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {ENGINE} from '../engine';import {Tensor} from '../tensor';import {DataType, Rank, ShapeMap} from '../types';import {makeOnesTypedArray, sizeFromShape} from './util';import {complex} from './complex';import {zeros} from './zeros';\n/**\n * Creates a `tf.Tensor` with all elements set to 1.\n * `tf.ones([2, 2]).print();`\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an element in the resulting tensor. Defaults to 'float'.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n * export function ones<R extends Rank>(shape: ShapeMap[R], dtype: DataType = 'float32'): Tensor<R> {\n if (dtype === 'complex64') {\n const real = ones(shape, 'float32');\n const imag = zeros(shape, 'float32');\n return complex(real, imag);\n }\n const values = makeOnesTypedArray(sizeFromShape(shape), dtype);\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {ENGINE} from '../engine';import {OnesLike, OnesLikeInputs} from '../kernel_names';import {Tensor} from '../tensor';import {NamedTensorMap} from '../tensor_types';import {convertToTensor} from '../tensor_util_env';import {TensorLike} from '../types';import {op} from './operation';\n/**\n * Creates a `tf.Tensor` with all elements set to 1 with the same shape as the given tensor.\n * `const x = tf.tensor([1, 2]);\n * tf.onesLike(x).print();`\n * @param x A tensor.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n * function onesLike_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'onesLike');\n const inputs: OnesLikeInputs = {x: $x};\n return ENGINE.runKernel(OnesLike, inputs as { } as NamedTensorMap);\n }\nexport const onesLike = op({onesLike_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\nimport {Tensor1D, Tensor2D} from '../tensor';import {convertToTensor} from '../tensor_util_env';import {TensorLike} from '../types';import * as util from './util';import {matMul} from './mat_mul';import {op}
```

```

from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the outer product of two vectors, `v1`\n and `v2`.\n * \n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([3, 4, 5]);\n * \n * tf.outerProduct(a, b).print();\n * \n * @param v1 The first vector in the outer product operation.\n * @param v2 The second vector in the outer product operation.\n * \n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction outerProduct_(\n  v1: Tensor1D|TensorLike, v2: Tensor1D|TensorLike): Tensor2D {\n  const $v1 =\n    convertToTensor(v1, 'v1', 'outerProduct');\n  const $v2 = convertToTensor(v2, 'v2', 'outerProduct');\n  \n  util.assert(\n    $v1.rank === 1 && $v2.rank === 1,\n    () => `Error in outerProduct: inputs must be rank 1, but got ranks ` +\n      `${$v1.rank} and `${$v2.rank}`.`);\n  \n  const v12D = reshape($v1, [-1, 1]);\n  const v22D = reshape($v2, [1, -\n    1]);\n  return matMul(v12D, v22D);\n}\n\nexport const outerProduct = op({outerProduct_});\n", "/*\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\nimport {ENGINE} from './engine';\nimport {PadV2, PadV2Attrs, PadV2Inputs} from\n './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport\n {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport\n {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Pads a `tf.Tensor` with a given value and\n paddings.\n * \n * This operation implements `CONSTANT` mode. For `REFLECT` and `SYMMETRIC`,\n * refer\n to `tf.mirrorPad`.\n * \n * Also available are stricter rank-specific methods with the same signature\n * as this method\n that assert that `paddings` is of given length.\n * - `tf.pad1d`\n * - `tf.pad2d`\n * - `tf.pad3d`\n * - `tf.pad4d`\n * \n * \n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.pad([[1, 2]]).print();\n * \n * @param x The tensor to pad.\n * @param paddings An array of length `R` (the rank of the tensor), where\n * each element is a length-2 tuple of\n ints `[padBefore, padAfter]`,\n * specifying how much to pad along each dimension of the tensor.\n * @param\n constantValue The pad value to use. Defaults to 0.\n * \n * @doc {heading: 'Tensors', subheading:\n 'Transformations'}\n */\nfunction pad_<T extends Tensor>(\n  x: T|TensorLike, paddings: Array<[number,\n  number]>, constantValue = 0): T {\n  const $x = convertToTensor(x, 'x', 'pad');\n  if ($x.rank === 0) {\n    throw\n      new Error('pad(scalar) is not defined. Pass non-scalar to pad');\n  }\n  \n  const attrs: PadV2Attrs = {paddings,\n    constantValue};\n  const inputs: PadV2Inputs = {x: $x};\n  return ENGINE.runKernel(\n    PadV2, inputs as\n    unknown as NamedTensorMap,\n    attrs as unknown as NamedAttrMap);\n}\n\nexport const pad =\n  op({pad_});\n", "/*\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless\n * required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */

```

```

=====\n\nimport {Tensor1D} from './tensor';\nimport {TensorLike} from './types';\nimport {assert} from './util';\nimport\n {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor1D` with a given value and\n paddings. See `pad` for details.\n * \n * function pad1d_(\n  x: Tensor1D|TensorLike, paddings: [number, number],\n  constantValue = 0): Tensor1D {\n  assert(\n    paddings.length === 2,\n    () => 'Invalid number of paddings.\n    Must be length of 2.);\n  return pad(x, [paddings], constantValue);\n}\n\nexport const pad1d =\n  op({pad1d_});\n", "/*\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n */

```

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```
=====  
*^import {Tensor2D} from './tensor';import {TensorLike} from './types';import {assert} from './util';import  
{op} from './operation';import {pad} from './pad';  
* Pads a `tf.Tensor2D` with a given value and  
paddings. See `pad` for details.  
*function pad2d(x: Tensor2D|TensorLike, paddings: [[number, number],  
[number, number]], constantValue = 0): Tensor2D {  
  assert(paddings.length === 2 &&  
    paddings[0].length === 2 &&  
    paddings[1].length === 2,  
    () => 'Invalid number of paddings. Must be  
length of 2 each.');  return pad(x, paddings, constantValue);  
}  
export const pad2d = op({pad2d_});  
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*
```

```
=====  
*^import {Tensor3D} from './tensor';import {TensorLike} from './types';import {assert} from './util';import  
{op} from './operation';import {pad} from './pad';  
* Pads a `tf.Tensor3D` with a given value and  
paddings. See `pad` for details.  
*function pad3d(x: Tensor3D|TensorLike, paddings: [[number,  
number], [number, number], [number, number]],  
constantValue = 0): Tensor3D {  
  assert(paddings.length  
=== 3 && paddings[0].length === 2 &&  
    paddings[1].length === 2 && paddings[2].length === 2,  
    ()  
=> 'Invalid number of paddings. Must be length of 2 each.');  return pad(x, paddings, constantValue);  
}  
export const pad3d = op({pad3d_});  
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* limitations under the License.  
*
```

```
=====  
*^import {Tensor4D} from './tensor';import {TensorLike} from './types';import {assert} from './util';import  
{op} from './operation';import {pad} from './pad';  
* Pads a `tf.Tensor4D` with a given value and  
paddings. See `pad` for details.  
*function pad4d(x: Tensor4D|TensorLike, paddings:  
  [number, number], [number, number], [number, number], [number, number],  
  constantValue = 0):  
Tensor4D {  
  assert(paddings.length === 4 && paddings[0].length === 2 &&  
    paddings[1].length ===  
2 && paddings[2].length === 2 &&  
    paddings[3].length === 2,  
    () => 'Invalid number of paddings. Must  
be length of 2 each.');  return pad(x, paddings, constantValue);  
}  
export const pad4d =  
op({pad4d_});  
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* limitations under the  
License.  
*
```

```
=====  
*^import {ENGINE} from './engine';import {SpaceToBatchND, SpaceToBatchNDAttrs,
```

```

SpaceToBatchNDInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from
 './operation';\n\n/**\n * This operation divides \"spatial\" dimensions `[1, ..., M]` of the input into\n * a grid of
 blocks of shape `blockShape`, and interleaves these blocks with\n * the `\"batch\"` dimension (0) such that in the
 output, the spatial\n * dimensions `[1, ..., M]` correspond to the position within the grid,\n * and the batch dimension
 combines both the position within a spatial block\n * and the original batch position. Prior to division into blocks,\n
 * the spatial dimensions of the input are optionally zero padded\n * according to `paddings`. See below for a precise
 description.\n *\n * ```js\n * const x = tf.tensor4d([1, 2, 3, 4], [1, 2, 2, 1]);\n * const blockShape = [2, 2];\n * const
 paddings = [[0, 0], [0, 0]];\n *\n * x.spaceToBatchND(blockShape, paddings).print();\n *\n * @param x A
 `tf.Tensor`. N-D with `x.shape` = `[batch] + spatialShape +\n * remainingShape`, where spatialShape has `M`
 dimensions.\n * @param blockShape A 1-D array. Must have shape `[M]`, all values must\n * be  $\geq 1$ .
 @param
 paddings A 2-D array. Must have shape `[M, 2]`, all values must be  $\geq 0$ . `paddings[i] = [padStart, padEnd]`
 specifies the amount to zero-pad\n * from input dimension `i + 1`, which corresponds to spatial dimension `i`. It\n
 * is required that\n * `(inputShape[i + 1] + padStart + padEnd) % blockShape[i] === 0`\n *\n * This operation is
 equivalent to the following steps:\n *\n * 1. Zero-pad the start and end of dimensions `[1, ..., M]` of the input\n
 * according to `paddings` to produce `padded` of shape paddedShape.\n *\n * 2. Reshape `padded` to
 `reshapedPadded` of shape:\n * `[batch] + [paddedShape[1] / blockShape[0], blockShape[0], ..., \n
 * paddedShape[M] / blockShape[M-1], blockShape[M-1]] + remainingShape`\n *\n * 3. Permute dimensions of
 `reshapedPadded` to produce `permutedReshapedPadded`\n * of shape: `blockShape + [batch] + [paddedShape[1] /
 blockShape[0], ..., \n
 * paddedShape[M] / blockShape[M-1]] + remainingShape`\n *\n * 4. Reshape
 `permutedReshapedPadded` to flatten `blockShape` into the\n * batch dimension, producing an output tensor of
 shape:\n * `[batch * prod(blockShape)] + [paddedShape[1] / blockShape[0], ..., \n
 * paddedShape[M] /
 blockShape[M-1]] + remainingShape`\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n
*\n\nfunction spaceToBatchND<T extends Tensor>(x: T|TensorLike, blockShape: number[], paddings:
 number[][]): T {\n  const $x = convertToTensor(x, 'x', 'spaceToBatchND');\n  util.assert(\n    $x.rank  $\geq$  1 +
 blockShape.length,\n    () => `input rank ${$x.rank} should be > than [blockShape] ${\n
  blockShape.length}`);\n  util.assert(\n    paddings.length === blockShape.length,\n    () => `paddings.shape[0]
 ${\n    paddings.length} must be equal to [blockShape] ${blockShape.length}`);\n  util.assert(\n
    $x.shape.reduce(\n      (a, b, i) => {\n        if (i > 0 && i <= blockShape.length) {\n          return a &&\n
          ((b + paddings[i - 1][0] + paddings[i - 1][1]) %\n            blockShape[i - 1] ===\n              0);\n        }\n        return a;\n      },\n      true),\n    () => `input spatial dimensions ${$x.shape.slice(1)} with paddings
 ${\n    paddings.toString()} must be divisible by blockShapes ${\n    blockShape.toString()}`);\n  const
 inputs: SpaceToBatchNDInputs = {x: $x};\n  const attrs: SpaceToBatchNDAttrs = {blockShape, paddings};\n  return
 ENGINE.runKernel(\n    SpaceToBatchND, inputs as { } as NamedTensorMap,\n    attrs as { } as
 NamedAttrMap);\n}\n\nexport const spaceToBatchND = op({spaceToBatchND_});\n\n/**\n * @license\n *
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 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *\n
 * =====\n
*\n\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {avgPool} from './avg_pool';\nimport
{batchToSpaceND} from './batch_to_space_nd';\nimport * as conv_util from './conv_util';\nimport {maxPool} from
 './max_pool';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {spaceToBatchND} from
 './space_to_batch_nd';\n\n/**\n * Performs an N-D pooling operation\n *\n * @param input The input tensor, of

```

rank 4 or rank 3 of shape `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.

`@param windowShape` The filter size: `[filterHeight, filterWidth]`. If `filterSize` is a single number, then `filterHeight == filterWidth`.

`@param poolingType` The type of pooling, either 'max' or 'avg'.

`@param pad` The type of padding algorithm: `'same'` and stride 1: output will be of same size as input, regardless of filter size.

`'valid'`: output will be smaller than input if filter is larger than 1x1. - For more info, see this guide: https://www.tensorflow.org/api_guides/python/nn#Convolution

`@param dilations` The dilation rates: `[dilationHeight, dilationWidth]` in which we sample input values across the height and width dimensions in dilated pooling. Defaults to `[1, 1]`. If `dilationRate` is a single number, then `dilationHeight == dilationWidth`. If it is greater than 1, then all values of `strides` must be 1.

`@param strides` The strides of the pooling: `[strideHeight, strideWidth]`. If `strides` is a single number, then `strideHeight == strideWidth`.

```

@doc {heading: 'Operations', subheading: 'Convolution'}
def pool_<T extends Tensor3D|Tensor4D>(
  input: T|TensorLike, windowShape: [number, number]|number,
  poolingType: 'avg'|'max', pad: 'valid'|'same'|number,
  dilations?: [number, number]|number, strides?: [number, number]|number)
  {
    if (dilations == null) {
      dilations = [1, 1];
    }
    if (strides == null) {
      strides = 1;
    }
    if (pad == 'valid') {
      pad = 'valid';
    }
    const $x = convertToTensor(input, 'x', 'maxPool');
    let x4D = $x as Tensor4D;
    let reshapedTo4D = false;
    if ($x.rank == 3) {
      reshapedTo4D = true;
      x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);
    }
    util.assert(
      conv_util.eitherStridesOrDilationsAreOne(strides, dilations),
      () => 'Error in pool: Either strides or dilations must be 1.' +
        `Got strides ${strides} and dilations ${dilations}`);
    const convInfo = conv_util.computePool2DInfo(
      x4D.shape, windowShape, strides, dilations, pad);
    const dilation: [number, number] = [convInfo.dilationHeight, convInfo.dilationWidth];
    // The following implementation does batchToSpace(pool(spaceToBatch(x)))
    // whenever dilation > 1 since the TF kernels do not support dilation > 1.
    // tslint:disable-next-line:max-line-length
    https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L1037
    let basePadding: number[][];
    if (pad == 'same') {
      basePadding = withSpaceToBatchBasePaddings(
        [convInfo.filterHeight, convInfo.filterWidth], dilation);
    } else {
      basePadding = [[0, 0], [0, 0]];
    }
    const isDilationOne = dilation[0] == 1 && dilation[1] == 1;
    const [adjustedPadding, adjustedCrops] = requiredSpaceToBatchPaddings(
      [convInfo.inHeight, convInfo.inWidth], dilation, basePadding);
    const convertedPad = isDilationOne ? pad : 'valid';
    const convertedX = isDilationOne ? x4D : spaceToBatchND(x4D, dilation, adjustedPadding);
    const forwardOp = poolingType == 'avg' ?
      () => avgPool(convertedX, windowShape, strides, convertedPad) :
      () => maxPool(convertedX, windowShape, strides, convertedPad);
    const y = forwardOp();
    const res = isDilationOne ? y : batchToSpaceND(y, dilation, adjustedCrops);
    if (reshapedTo4D) {
      return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;
    }
    return res as T;
  }
  // Helper function to compute crops and paddings for pool with dilation > 1.
  // tslint:disable-next-line:max-line-length
  https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/array_ops.py#L2184
  function requiredSpaceToBatchPaddings(
    inputShape: [number, number], blockShape: [number, number],
    basePadding: number[][]) {
    const padStart = basePadding.map(b => b[0]);
    const origPadEnd = basePadding.map(b => b[1]);
    const fullInputShape = inputShape.concat(padStart, origPadEnd);
    const padEndExtra = blockShape.map((b, i) => (b - fullInputShape[i] % b) % b);
    const padEnd = origPadEnd.map((s, i) => s + padEndExtra[i]);
    const paddings = blockShape.map(
      (_, i) => [padStart[i], padEnd[i]]);
    const crops = blockShape.map(
      (_, i) => [0, padEndExtra[i]]);
    return [paddings, crops];
  }
  // Helper function to compute base paddings for pool with dilation > 1.
  // tslint:disable-next-line:max-line-length
  https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L524
  function withSpaceToBatchBasePaddings(
    filterShape: [number, number], dilation: [number, number]) {
    // Spatial dimensions of the filters and the upsampled filters in which we
    // introduce (rate - 1) zeros between consecutive filter values.
    const dilatedFilterShape = filterShape.map((s, i) => {
      return s + (s - 1) * (dilation[i] - 1);
    });
    const padExtraShape = dilatedFilterShape.map(s => s - 1);
    // When padding is

```



```
odd, we pad more at end, following the same\n // convention as conv2d.\n const padExtraStart =  
padExtraShape.map(s => Math.floor(s / 2));\n const padExtraEnd = padExtraShape.map((s, i) => s -  
padExtraStart[i]);\n return padExtraShape.map((_, i) => {\n return [padExtraStart[i], padExtraEnd[i]];\n  
});\n\n\nexport const pool = op({pool_});\n","**\n * @license\n * Copyright 2020 Google LLC. All Rights  
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file  
except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *  
Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n  
*\nimport {ENGINE} from '../engine';\nimport {Pow, PowInputs} from '../kernel_names';\nimport {Tensor} from  
../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from  
../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport  
{op} from '../operation';\n\n**\n * Computes the power of one `tf.Tensor` to another. Supports broadcasting.\n *  
 * Given a `tf.Tensor` x and a `tf.Tensor` y, this operation computes x^y for  
 * corresponding elements in x and y.  
 *  
 * The result's dtype will be the upcasted\n * type of the `base` and `exp` dtypes.\n *  
 *  
 * const a =  
tf.tensor([[2, 3], [4, 5]])\n * const b = tf.tensor([[1, 2], [3, 0]]).toInt();\n *  
 * a.pow(b).print(); // or tf.pow(a, b)\n *  
 *  
 * const a = tf.tensor([[1, 2], [3, 4]])\n * const b = tf.tensor(2).toInt();\n *  
 * a.pow(b).print(); // or  
tf.pow(a, b)\n *  
 * We also expose `powStrict` which has the same signature as this op and\n * asserts that  
 * `base` and `exp` are the same shape (does not broadcast).\n *  
 * @param base The base `tf.Tensor` to pow element-  
wise.\n * @param exp The exponent `tf.Tensor` to pow element-wise.\n * @doc {heading: 'Operations',  
subheading: 'Arithmetic'}\n\nfunction pow<T extends Tensor>(\n base: Tensor|TensorLike, exp:  
Tensor|TensorLike): T {\n let $base = convertToTensor(base, 'base', 'pow');\n let $exp = convertToTensor(exp,  
'exp', 'pow');\n [$base, $exp] = makeTypesMatch($base, $exp);\n\n const inputs: PowInputs = { a: $base, b:  
$exp};\n\n return ENGINE.runKernel(Pow, inputs as {} as NamedTensorMap);\n}\n\nexport const pow =  
op({pow_});\n","**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the  
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the  
License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *  
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n *
```

```
=====\n  
*\nimport {ENGINE} from '../engine';\nimport {Prelu, PreluInputs} from '../kernel_names';\nimport {Tensor}  
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from  
../tensor_util_env';\nimport {TensorLike} from '../types';\nimport  
{op} from '../operation';\n\n**\n * Computes leaky rectified linear element-wise with parametric alphas.\n *  
 *  $x < 0 ? \alpha * x : f(x) = x$ \n *  
 *  
 * const x = tf.tensor1d([-1, 2, -3, 4]);\n * const alpha = tf.scalar(0.1);\n *  
 * x.prelu(alpha).print(); // or tf.prelu(x,  
alpha)\n *  
 * @param x The input tensor.\n * @param alpha Scaling factor for negative values.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n\nfunction prelu<T extends Tensor>(\n x: T|TensorLike, alpha:  
T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'prelu');\n const $alpha = convertToTensor(alpha, 'alpha',  
'prelu');\n\n const inputs: PreluInputs = {x: $x, alpha: $alpha};\n return ENGINE.runKernel(Prelu, inputs as {} as  
NamedTensorMap);\n}\n\nexport const prelu = op({prelu_});\n","**\n * @license\n * Copyright 2020 Google  
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *  
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
```

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```
=====
*\n\nimport {ENGINE} from './engine';\nimport {Prod, ProdAttrs, ProdInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes the product of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims` is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in `axes`. If `keepDims` is true, the reduced dimensions are retained with length 1. If `axes` has no entries, all dimensions are reduced, and a `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n * x.prod().print();\n // or tf.prod(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const axis = 1;\n * x.prod(axis).print();\n // or tf.prod(x, axis)\n * ```\n *\n * @param x The input tensor to compute the product over. If the dtype is `bool` it will be converted to `int32` and the output dtype will be `int32`.\n *\n * @param axis The dimension(s) to reduce. By default it reduces all dimensions.\n *\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction prod_<T extends Tensor>(\n  x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n  let $x = convertToTensor(x, 'x', 'prod');\n  if ($x.dtype === 'bool') {\n    // bool is not an allowed type for the underlying kernel.\n    $x = cast($x, 'int32');\n  }\n  const inputs: ProdInputs = {x: $x};\n  const attrs: ProdAttrs = {axis, keepDims};\n  return ENGINE.runKernel(\n    Prod, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const prod = op({prod_});\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
```

```
*\n\nimport {ENGINE} from './engine';\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\nimport {sizeFromShape} from './util';\nimport {op} from './operation';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a random number generator\n * function defined by the user.\n *\n * @param shape An array of integers defining the output tensor shape.\n *\n * @param randFunction A random number generator function which is called\n * for each element in the output tensor.\n *\n * @param dtype The data type of the output tensor. Defaults to 'float32'.\n *\n * @doc {heading: 'Random', subheading: 'Tensor'}\n */\nfunction rand_<R extends Rank>(\n  shape: ShapeMap[R], randFunction: () => number,\n  dtype?: DataType): Tensor<R> {\n  const size = sizeFromShape(shape);\n  let values = null;\n  if (dtype === null || dtype === 'float32') {\n    values = new Float32Array(size);\n  } else if (dtype === 'int32') {\n    values = new Int32Array(size);\n  } else if (dtype === 'bool') {\n    values = new Uint8Array(size);\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n  for (let i = 0; i < size; i++) {\n    values[i] = randFunction();\n  }\n  return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;\n}\n\nexport const rand = op({rand_});\n\n/**\n * A port of an algorithm by Johannes Baagøe <baagoe@baagoe.com>, 2010\n * http://baagoe.com/en/RandomMusings/javascript\n * https://github.com/nquinlan/better-random-numbers-for-javascript-mirror\n * Original work is under MIT license -\n * Copyright (C) 2010 by Johannes Baagøe <baagoe@baagoe.org>\n * Permission is hereby granted, free of charge, to any person obtaining a copy\n * of this software and associated documentation files (the "Software"), to deal\n * in the Software without restriction, including without limitation the rights\n * to use, copy, modify, merge, publish, distribute, sublicense, and/or sell\n * copies of the Software, and to permit persons to whom the Software is\n * furnished to do so, subject to the following conditions:\n * -\n * The above copyright notice and this permission notice shall be included in\n * all copies or substantial portions of the Software.\n * -\n * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT
```

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```
(function(global, module, define)
{
function Alea(seed) {
  var me = this, mash = Mash();
  me.next = function() {
    var t = 2091639 * me.s0 + me.c * 2.3283064365386963e-10; // 2^-32
    me.s0 = me.s1;
    me.s1 = me.s2;
    return me.s2 = t - (me.c = t | 0);
  };
  // Apply the seeding algorithm from Baagoe.
  me.c = 1;
  me.s0 = mash(' ');
  me.s1 = mash(' ');
  me.s2 = mash(' ');
  me.s0 -= mash(seed);
  if (me.s0 < 0) { me.s0 += 1; }
  me.s1 -= mash(seed);
  if (me.s1 < 0) { me.s1 += 1; }
  me.s2 -= mash(seed);
  if (me.s2 < 0) { me.s2 += 1; }
  mash = null;
}

function copy(f, t) {
  t.c = f.c;
  t.s0 = f.s0;
  t.s1 = f.s1;
  t.s2 = f.s2;
  return t;
}

function impl(seed, opts) {
  var xg = new Alea(seed),
      state = opts && opts.state,
      prng = xg.next;
  prng.int32 = function() { return (xg.next() * 0x100000000) | 0; };
  prng.double = function() { return prng() + (prng() * 0x200000 | 0) * 1.1102230246251565e-16; // 2^-53 };
  prng.quick = prng;
  if (state) {
    if (typeof(state) === 'object')
      copy(state, xg);
    prng.state = function() { return copy(xg, {}); };
  }
  return prng;
}

function Mash() {
  var n = 0xefc8249d;
  var mash = function(data) {
    data = data.toString();
    for (var i = 0; i < data.length; i++) {
      n += data.charCodeAt(i);
      var h = 0.02519603282416938 * n;
      n = h >>> 0;
      h -= n;
      h *= n;
      n = h >>> 0;
      h -= n;
      n += h * 0x100000000; // 2^32
    }
    return (n >>> 0) * 2.3283064365386963e-10; // 2^-32
  };
  return mash;
}

if (module && module.exports) {
  module.exports = impl;
} else if (define && define.amd) {
  define(function() { return impl; });
} else {
  this.alea = impl;
}

})(this, (typeof module) === 'object' && module, // present in node.js
(typeof define) === 'function' && define // present with an AMD loader

), /* A Javascript implementaion of the "xor128" prng algorithm by George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper
(function(global, module, define) {
function XorGen(seed) {
  var me = this, strseed = "";
  me.x = 0;
  me.y = 0;
  me.z = 0;
  me.w = 0;
  // Set up generator function.
  me.next = function() {
    var t = me.x ^ (me.x << 11);
    me.x = me.y;
    me.y = me.z;
    me.z = me.w;
    return me.w ^= (me.w >>> 19) ^ t ^ (t >>> 8);
  };
  if (seed === (seed | 0)) {
    // Integer seed.
    me.x = seed;
  } else {
    // String seed.
    strseed += seed;
  }
  // Mix in string seed, then discard an initial batch of 64 values.
  for (var k = 0; k < strseed.length + 64; k++) {
    me.x ^= strseed.charCodeAt(k) | 0;
    me.next();
  }
}

function copy(f, t) {
  t.x = f.x;
  t.y = f.y;
  t.z = f.z;
  t.w = f.w;
  return t;
}

function impl(seed, opts) {
  var xg = new XorGen(seed),
      state = opts && opts.state,
      prng = function() { return (xg.next() >>> 0) / 0x100000000; };
  prng.double = function() {
    do {
      var top = xg.next() >>> 11,
          bot = (xg.next() >>> 0) / 0x100000000,
          result = (top + bot) / (1 << 21);
    } while (result === 0);
    return result;
  };
  prng.int32 = xg.next;
  prng.quick = prng;
  if (state) {
    if (typeof(state) === 'object')
      copy(state, xg);
    prng.state = function() { return copy(xg, {}); };
  }
  return prng;
}

if (module && module.exports) {
  module.exports = impl;
} else if (define && define.amd) {
  define(function() { return impl; });
} else {
  this.xor128 = impl;
}

})(this, (typeof module) === 'object' && module, // present in node.js
(typeof define) === 'function' && define // present with an AMD loader

), /* A Javascript implementaion of the "xorwow" prng algorithm by George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper
(function(global, module, define) {
function XorGen(seed) {
  var me = this, strseed = "";
  // Set up generator function.
  me.next = function() {
    var t = (me.x ^ (me.x >>> 2));
    me.x = me.y;
    me.y = me.z;
    me.z = me.w;
    me.w = me.v;
    return (me.d = (me.d + 362437 | 0)) + (me.v = (me.v ^ (me.v << 4)) ^ (t ^ (t << 1))) | 0;
  };
  me.x = 0;
  me.y = 0;
  me.z = 0;
  me.w = 0;
  me.v = 0;
  if (seed === (seed | 0)) {
    // Integer seed.
    me.x = seed;
  } else {
    // String seed.
    strseed += seed;
  }
  // Mix in string seed, then discard an initial batch of 64 values.
  for (var k = 0; k < strseed.length + 64; k++) {
    me.x ^= strseed.charCodeAt(k) | 0;
    if (k === strseed.length) {
      me.d = me.x << 10 ^ me.x >>> 4;
    }
    me.next();
  }
}

function copy(f, t) {
  t.x = f.x;
  t.y = f.y;
  t.z = f.z;
  t.w = f.w;
  t.v = f.v;
  t.d = f.d;
  return t;
}

function impl(seed, opts) {
  var xg = new XorGen(seed),
      state = opts && opts.state,
```

```

prng = function() { return (xg.next() >>> 0) / 0x100000000; };
prng.double = function() {
  do {
    var top = xg.next() >>> 11,
        bot = (xg.next() >>> 0) / 0x100000000,
        result = (top + bot) / (1 << 21);
  } while (result === 0);
  return result;
};
prng.int32 = xg.next();
prng.quick = prng;
if (state) {
  if (typeof(state) === 'object') copy(state, xg);
  prng.state = function() { return copy(xg, {}); };
}
return prng;
}
}
if (module && module.exports) {
  module.exports = impl;
} else if (define && define.amd) {
  define(function() { return impl; });
} else {
  this.xorwow = impl;
}
})(this, (typeof module) === 'object' && module, // present in node.js
(typeof define) === 'function' && define // present with an AMD loader
, "A Javascript implementaion of the 'xorshift7' algorithm by François Panneton and Pierre L'ecuyer."
, "On the Xorgshift Random Number Generators"
);
http://saluc.engr.uconn.edu/refs/crypto/rng/panneton05onthexorshift.pdf
(function(global, module, define) {
  function XorGen(seed) {
    var me = this;
    // Set up generator function.
    me.next = function() {
      // Update xor generator.
      var X = me.x, i = me.i, t, v, w;
      t = X[i]; t ^= (t >>> 7); v = t ^ (t << 24);
      t = X[(i + 1) & 7]; v ^= t ^ (t >>> 10);
      t = X[(i + 3) & 7]; v ^= t ^ (t >>> 3);
      t = X[(i + 4) & 7]; v ^= t ^ (t << 7);
      t = X[(i + 7) & 7]; t = t ^ (t << 13); v ^= t ^ (t << 9);
      X[i] = v; me.i = (i + 1) & 7;
      return v;
    };
    function init(me, seed) {
      var j, w, X = [];
      if (seed === (seed | 0)) {
        // Seed state array using a 32-bit integer.
        w = X[0] = seed;
      } else {
        // Seed state using a string.
        seed = "" + seed;
        for (j = 0; j < seed.length; ++j) {
          X[j & 7] = (X[j & 7] << 15) ^ (seed.charCodeAt(j) + X[(j + 1) & 7] << 13);
        }
        // Enforce an array length of 8, not all zeroes.
        while (X.length < 8) X.push(0);
        for (j = 0; j < 8 && X[j] === 0; ++j);
        if (j == 8) w = X[7] = -1; else w = X[j];
        me.x = X; me.i = 0;
        // Discard an initial 256 values.
        for (j = 256; j > 0; --j) me.next();
      }
      init(me, seed);
    }
    function copy(f, t) {
      t.x = f.x.slice();
      t.i = f.i;
      return t;
    }
    function impl(seed, opts) {
      if (seed == null) seed = +(new Date);
      var xg = new XorGen(seed),
          state = opts && opts.state,
          prng = function() { return (xg.next() >>> 0) / 0x100000000; };
      prng.double = function() {
        do {
          var top = xg.next() >>> 11,
              bot = (xg.next() >>> 0) / 0x100000000,
              result = (top + bot) / (1 << 21);
        } while (result === 0);
        return result;
      };
      prng.int32 = xg.next();
      prng.quick = prng;
      if (state) {
        if (state.x) copy(state, xg);
        prng.state = function() { return copy(xg, {}); };
      }
      return prng;
    }
    if (module && module.exports) {
      module.exports = impl;
    } else if (define && define.amd) {
      define(function() { return impl; });
    } else {
      this.xorshift7 = impl;
    }
  }
  this, (typeof module) === 'object' && module, // present in node.js
  (typeof define) === 'function' && define // present with an AMD loader
, "A Javascript implementaion of Richard Brent's Xorgens xor4096 algorithm."
, "This fast non-cryptographic random number generator is designed for use in Monte-Carlo algorithms. It combines a long-period xorshift generator with a Weyl generator, and it passes all common batteries of stastical tests for randomness while consuming only a few nanoseconds for each prng generated. For background on the generator, see Brent's paper: 'Some long-period random number generators using shifts and xors.'"
, http://arxiv.org/pdf/1004.3115v1.pdf
, Usage:
var xor4096 = require('xor4096');
random = xor4096(1); // Seed with int32 or string.
assert.equal(random(), 0.1520436450538547); // (0, 1) range, 53 bits.
assert.equal(random.int32(), 1806534897); // signed int32, 32 bits.
// For nonzero numeric keys, this impelementation provides a sequence identical to that by Brent's xorgens 3 implementaion in C. This implementation also provides for initalizing the generator with string seeds, or for saving and restoring the state of the generator.
// On Chrome, this prng benchmarks about 2.1 times slower than Javascript's built-in Math.random().
(function(global, module, define) {
  function XorGen(seed) {
    var me = this;
    // Set up generator function.
    me.next = function() {
      var w = me.w, X = me.X, i = me.i, t, v;
      // Update Weyl generator.
      me.w = w = (w + 0x61c88647) | 0;
      // Update xor generator.
      v = X[(i + 34) & 127];
      t = X[(i + 1) & 127]; v ^= v << 13; t ^= t << 17; v ^= v >>> 15; t ^= t >>> 12;
      // Update Xor generator array state.
      v = X[i] = v ^ t; me.i = i;
      // Result is the combination.
      return (v + (w ^ (w >>> 16))) | 0;
    };
    function init(me, seed) {
      var t, v, i, j, w, X = [], limit = 128;
      if (seed === (seed | 0)) {
        // Numeric seeds initialize v, which is used to generates X.
        v = seed; seed = null;
      } else {
        // String seeds are mixed into v and X one character at a time.
        seed = seed + '\0'; v = 0;
        limit = Math.max(limit, seed.length);
      }
      // Initialize circular array and weyl value.
      for (i = 0, j = -32; j <

```

```

limit; ++j) {\n    // Put the unicode characters into the array, and shuffle them.\n    if (seed) v ^=
seed.charCodeAt((j + 32) % seed.length);\n    // After 32 shuffles, take v as the starting w value.\n    if (j === 0) w
= v;\n    v ^= v << 10;\n    v ^= v >>> 15;\n    v ^= v << 4;\n    v ^= v >>> 13;\n    if (j >= 0) {\n    w = (w +
0x61c88647) | 0; // Weyl.\n    t = (X[j & 127] ^=(v + w)); // Combine xor and weyl to init array.\n    i = (0
=== t) ? i + 1 : 0; // Count zeroes.\n    }\n    }\n    // We have detected all zeroes; make the key nonzero.\n    if (i
>= 128) {\n    X[(seed && seed.length || 0) & 127] = -1;\n    }\n    // Run the generator 512 times to further mix the
state before using it.\n    // Factoring this as a function slows the main generator, so it is just\n    // unrolled here.
The weyl generator is not advanced while warming up.\n    i = 127;\n    for (j = 4 * 128; j > 0; --j) {\n    v = X[(i +
34) & 127];\n    t = X[i = ((i + 1) & 127)];\n    v ^= v << 13;\n    t ^= t << 17;\n    v ^= v >>> 15;\n    t ^= t
>>> 12;\n    X[i] = v ^ t;\n    }\n    // Storing state as object members is faster than using closure variables.\n
me.w = w;\n    me.X = X;\n    me.i = i;\n    }\n\n    init(me, seed);\n    }\n\n    function copy(f, t) {\n    t.i = f.i;\n    t.w = f.w;\n
t.X = f.X.slice();\n    return t;\n    };\n\n    function impl(seed, opts) {\n    if (seed == null) seed = +(new Date);\n    var xg =
new XorGen(seed),\n    state = opts && opts.state,\n    prng = function() { return (xg.next() >>> 0) /
0x100000000; }\n    prng.double = function() {\n    do {\n    var top = xg.next() >>> 11,\n    bot = (xg.next()
>>> 0) / 0x100000000,\n    result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return result;\n    };\n
prng.int32 = xg.next;\n    prng.quick = prng;\n    if (state) {\n    if (state.X) copy(state, xg);\n    prng.state = function() {
return copy(xg, {}); }\n    }\n    return prng;\n    }\n\n    if (module && module.exports) {\n    module.exports = impl;\n    } else
if (define && define.amd) {\n    define(function() { return impl; });\n    } else {\n    this.xor4096 = impl;\n    }\n\n    })(\n    this,
// window object or global\n    (typeof module) == 'object' && module, // present in node.js\n    (typeof define) == 'function' && define // present with an AMD loader\n    );\n\n    },""/ A Javascript implementaion of the
\"Tyche-i\" prng algorithm by\n    Samuel Neves and Filipe Araujo.\n    See https://eden.dei.uc.pt/~sneves/pubs/2011-
snfa2.pdf\n    (function(global, module, define) {\n\n    function XorGen(seed) {\n    var me = this, strseed = \";\n\n    // Set
up generator function.\n    me.next = function() {\n    var b = me.b, c = me.c, d = me.d, a = me.a;\n    b = (b << 25) ^
(b >>> 7) ^ c;\n    c = (c - d) | 0;\n    d = (d << 24) ^ (d >>> 8) ^ a;\n    a = (a - b) | 0;\n    me.b = b = (b << 20) ^ (b
>>> 12) ^ c;\n    me.c = c = (c - d) | 0;\n    me.d = (d << 16) ^ (c >>> 16) ^ a;\n    return me.a = (a - b) | 0;\n    };\n\n    /* The following is non-inverted tyche, which has better internal\n    * bit diffusion, but which is about 25% slower
than tyche-i in JS.\n    me.next = function() {\n    var a = me.a, b = me.b, c = me.c, d = me.d;\n    a = (me.a + me.b | 0)
>>> 0;\n    d = me.d ^ a; d = d << 16 ^ d >>> 16;\n    c = me.c + d | 0;\n    b = me.b ^ c; b = b << 12 ^ d >>> 20;\n
me.a = a = a + b | 0;\n    d = d ^ a; me.d = d = d << 8 ^ d >>> 24;\n    me.c = c = c + d | 0;\n    b = b ^ c;\n    return
me.b = (b << 7 ^ b >>> 25);\n    }\n\n    *^\n\n    me.a = 0;\n    me.b = 0;\n    me.c = 2654435769 | 0;\n    me.d =
1367130551;\n\n    if (seed === Math.floor(seed)) {\n    // Integer seed.\n    me.a = (seed / 0x100000000) | 0;\n    me.b
= seed | 0;\n    } else {\n    // String seed.\n    strseed += seed;\n    }\n\n    // Mix in string seed, then discard an initial
batch of 64 values.\n    for (var k = 0; k < strseed.length + 20; k++) {\n    me.b ^= strseed.charCodeAt(k) | 0;\n
me.next();\n    }\n\n    }\n\n    function copy(f, t) {\n    t.a = f.a;\n    t.b = f.b;\n    t.c = f.c;\n    t.d = f.d;\n    return t;\n    };\n\n    function
impl(seed, opts) {\n    var xg = new XorGen(seed),\n    state = opts && opts.state,\n    prng = function() { return
(xg.next() >>> 0) / 0x100000000; }\n    prng.double = function() {\n    do {\n    var top = xg.next() >>> 11,\n    bot = (xg.next() >>> 0) / 0x100000000,\n    result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return
result;\n    };\n    prng.int32 = xg.next;\n    prng.quick = prng;\n    if (state) {\n    if (typeof(state) == 'object') copy(state,
xg);\n    prng.state = function() { return copy(xg, {}); }\n    }\n    return prng;\n    }\n\n    if (module && module.exports)
{\n    module.exports = impl;\n    } else if (define && define.amd) {\n    define(function() { return impl; });\n    } else {\n    this.tychei = impl;\n    }\n\n    })(\n    this,\n    (typeof module) == 'object' && module, // present in node.js\n    (typeof define) == 'function' && define // present with an AMD loader\n    );\n\n    },"/*\n    Copyright 2014 David
Bau.\n\n    Permission is hereby granted, free of charge, to any person obtaining\n    a copy of this software and
associated documentation files (the\n    \"Software\"), to deal in the Software without restriction, including\n    without
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```

(function (pool, math) {
  // The following constants are related to IEEE 754 limits.
  var global = this,
      width = 256, // each RC4 output is 0 <= x < 256
      chunks = 6, // at least six RC4 outputs for each double
      digits = 52, // there are 52 significant digits in a double
      rngname = 'random', // rngname: name for Math.random and Math.seedrandom
      startdenom = math.pow(width, chunks),
      significance = math.pow(2, digits),
      overflow = significance * 2,
      mask = width - 1,
      nodecrypto; // node.js crypto module, initialized at the bottom.

  // seedrandom()
  // This is the seedrandom function described above.
  function seedrandom(seed, options, callback) {
    var key = [];
    options = (options == true) ? { entropy: true } : (options || {});
    // Flatten the seed string or build one from local entropy if needed.
    var shortseed = mixkey(flatten(
      options.entropy ? [seed, toString(pool)] : (seed == null) ? autoseed() : seed, 3),
      key);
    // Use the seed to initialize an ARC4 generator.
    var arc4 = new ARC4(key);
    // This function returns a random double in [0, 1) that contains randomness in every bit of the mantissa of the IEEE 754 value.
    var prng = function() {
      var n = arc4.g(chunks), // Start with a numerator n < 2 ^ 48
          d = startdenom, // and denominator d = 2 ^ 48.
          x = 0; // and no 'extra last byte'.
      while (n < significance) {
        // Fill up all significant digits by
        n = (n + x) * width; // shifting numerator and
        d *= width; // denominator and generating a
        x = arc4.g(1); // new least-significant byte.
      }
      while (n >= overflow) {
        // To avoid rounding up, before adding
        n /= 2; //
        last byte, shift everything
        d /= 2; // right using integer math until
        x >>= 1; // we have exactly the desired bits.
      }
      return (n + x) / d; // Form the number within [0, 1).
    };
    prng.int32 = function() { return arc4.g(4) | 0; };
    prng.quick = function() { return arc4.g(4) / 0x100000000; };
    prng.double = prng;
    // Mix the randomness into accumulated entropy.
    mixkey(toString(arc4.S), pool);
    // Calling convention: what to return as a function of prng, seed, is_math.
    return (options.pass || callback || function(prng, seed, is_math_call, state) {
      if (state) {
        // Load the arc4 state from the given state if it has an S array.
        if (state.S) { copy(state, arc4); }
        // Only provide the .state method if requested via options.state.
        prng.state = function() { return copy(arc4, {}); };
      }
      // If called as a method of Math (Math.seedrandom()), mutate
      // Math.random because that is how seedrandom.js has worked since v1.0.
      if (is_math_call) { math[rngname] = prng; return seed; }
      // Otherwise, it is a newer calling convention, so return the
      // prng directly.
      else return prng;
    })(prng, seed, options.global ? (this == math) : options.state);
  }
  math['seed' + rngname] = seedrandom;
  // An ARC4 implementation. The constructor takes a key in the form of an array of at most (width) integers that should be 0 <= x < (width).
  // The g(count) method returns a pseudorandom integer that concatenates the next (count) outputs from ARC4. Its return value is a number x that is in the range 0 <= x < (width ^ count).
  function ARC4(key) {
    var t, keylen = key.length,
        me = this, i = 0, j = me.i = me.j = 0,
        s = me.S = [];
    // The empty key [] is treated as [0].
    if (!keylen) { key = [keylen++]; }
    // Set up S using the standard key scheduling algorithm.
    while (i < width) {
      s[i] = i++;
      for (i = 0; i < width; i++) {
        s[j = mask & (j + key[i % keylen] + (t = s[i]))];
        s[j] = t;
      }
    }
    // The "g" method returns the next (count) outputs as one number.
    (me.g = function(count) {
      // Using instance members instead of closure state nearly doubles speed.
      var t, r = 0,
          i = me.i, j = me.j, s = me.S;
      while (count--) {
        t = s[i = mask & (i + 1)];
        r = r * width + s[mask & ((s[i] = s[j = mask & (j + t)]) + (s[j] = t))];
      }
      me.i = i; me.j = j;
      return r;
    })
    // For robust unpredictability, the function call below automatically
    // discards an initial batch of values. This is called RC4-drop[256].
    // See http://google.com/search?q=rsa+fluhrer+response&btnI
  }
  copy(me, math);
  // Copies internal state of ARC4 to or from a plain object.
  function copy(f, t) {
    t.i = f.i;
    t.j = f.j;
    t.S = f.S.slice();
    return t;
  }
  // Converts an object tree to nested arrays of strings.
  function flatten(obj, depth) {
    var result = [], typ = (typeof obj), prop;
    if (depth && typ == 'object')

```



```

./test_util';\nimport {TypedArray} from './types';\n\nexport interface RandomBase {\n  nextValue():\n  number;\n}\n\nexport interface RandomGamma {\n  nextValue(): number;\n}\n\nexport interface\nRandNormalDataTypes {\n  float32: Float32Array;\n  int32: Int32Array;\n}\n\nexport interface\nRandGammaDataTypes {\n  float32: Float32Array;\n  int32: Int32Array;\n}\n\n//\nhttps://en.wikipedia.org/wiki/Marsaglia_polar_method\nexport class MPRandGauss implements RandomBase {\n  private mean: number;\n  private stdDev: number;\n  private nextVal: number;\n  private dtype?: keyof\nRandNormalDataTypes;\n  private truncated?: boolean;\n  private upper?: number;\n  private lower?: number;\n  private random: seedrandom.prng;\n\n  constructor(\n    mean: number, stdDeviation: number, dtype?: keyof\nRandNormalDataTypes,\n    truncated?: boolean, seed?: number) {\n    this.mean = mean;\n    this.stdDev =\nstdDeviation;\n    this.dtype = dtype;\n    this.nextVal = NaN;\n    this.truncated = truncated;\n    if (this.truncated)\n{\n  this.upper = this.mean + this.stdDev * 2;\n  this.lower = this.mean - this.stdDev * 2;\n}\n    const\nseedValue = seed ? seed : Math.random();\n    this.random = seedrandom.alea(seedValue.toString());\n  }\n\n  /**\nReturns next sample from a Gaussian distribution. *\n  public nextValue(): number {\n    if (!isNaN(this.nextVal))\n{\n  const value = this.nextVal;\n  this.nextVal = NaN;\n  return value;\n}\n    let resultX: number,\nresultY: number;\n    let isValid = false;\n    while (!isValid) {\n      let v1: number, v2: number, s: number;\n      do\n{\n  v1 = 2 * this.random() - 1;\n  v2 = 2 * this.random() - 1;\n  s = v1 * v1 + v2 * v2;\n      } while (s >=\n1 || s === 0);\n      const mul = Math.sqrt(-2.0 * Math.log(s) / s);\n      resultX = this.mean + this.stdDev * v1 *\nmul;\n      resultY = this.mean + this.stdDev * v2 * mul;\n      if (!this.truncated || this.isValidTruncated(resultX))\n{\n  isValid = true;\n}\n    }\n    if (!this.truncated || this.isValidTruncated(resultY)) {\n      this.nextVal =\nthis.convertValue(resultY);\n    }\n    return this.convertValue(resultX);\n  }\n\n  /** Handles proper rounding for\nnon-floating-point numbers. *\n  private convertValue(value: number): number {\n    if (this.dtype == null ||\nthis.dtype === 'float32') {\n      return value;\n    }\n    return Math.round(value);\n  }\n\n  /** Returns true if less\nthan 2-standard-deviations from the mean. *\n  private isValidTruncated(value: number): boolean {\n    return value\n<= this.upper && value >= this.lower;\n  }\n}\n\n// Marsaglia, George, and Wai Wan Tsang. 2000. \"A Simple\nMethod for Generating\n// Gamma Variables.\"\nexport class RandGamma implements RandomGamma {\n  private\nalpha: number;\n  private beta: number;\n  private d: number;\n  private c: number;\n  private dtype?: keyof\nRandGammaDataTypes;\n  private randu: seedrandom.prng;\n  private randn: MPRandGauss;\n\n  constructor(\nalpha: number, beta: number, dtype: keyof RandGammaDataTypes,\n  seed?: number) {\n    this.alpha = alpha;\n    this.beta = 1 / beta; // convert rate to scale parameter\n    this.dtype = dtype;\n    const seedValue = seed ? seed :\nMath.random();\n    this.randu = seedrandom.alea(seedValue.toString());\n    this.randn = new MPRandGauss(0, 1,\ndtype, false, this.randu());\n\n    if (alpha < 1) {\n      this.d = alpha + (2 / 3);\n    } else {\n      this.d = alpha - (1 /\n3);\n    }\n    this.c = 1 / Math.sqrt(9 * this.d);\n  }\n\n  /** Returns next sample from a gamma distribution. *\n  public nextValue(): number {\n    let x2: number, v0: number, v1: number, x: number, u: number, v: number;\n    while (true) {\n      do {\n        x = this.randn.nextValue();\n        v = 1 + (this.c * x);\n      } while (v <= 0);\n      v *=\nv * v;\n      x2 = x * x;\n      v0 = 1 - (0.331 * x2 * x2);\n      v1 = (0.5 * x2) + (this.d * (1 - v + Math.log(v)));\n      u\n= this.randu();\n      if (u < v0 || Math.log(u) < v1) {\n        break;\n      }\n    }\n    v = (1 / this.beta) * this.d * v;\n    if (this.alpha < 1) {\n      v *= Math.pow(this.randu(), 1 / this.alpha);\n    }\n    return this.convertValue(v);\n  }\n\n  /** Handles proper rounding for non-floating-point numbers. *\n  private convertValue(value: number): number {\n    if (this.dtype === 'float32') {\n      return value;\n    }\n    return Math.round(value);\n  }\n}\n\nexport class\nUniformRandom implements RandomBase {\n  private min: number;\n  private range: number;\n  private random:\nseedrandom.prng;\n  private dtype?: keyof RandNormalDataTypes;\n\n  constructor(\n  min = 0, max = 1, dtype?:\nkeyof RandNormalDataTypes,\n  seed?: string|number) {\n    this.min = min;\n    this.range = max - min;\n    this.dtype = dtype;\n    if (seed == null) {\n      seed = Math.random();\n    }\n    if (typeof seed === 'number') {\n      seed = seed.toString();\n    }\n    if (!this.canReturnFloat() && this.range <= 1) {\n      throw new Error(\n`The difference between ${min} - ${max} <= 1 and dtype is not float`);\n    }\n    this.random =\nseedrandom.alea(seed);\n  }\n\n  /** Handles proper rounding for non floating point numbers. *\n  private\n  canReturnFloat() => (\n    this.dtype == null || this.dtype === 'float32');\n\n  private convertValue(value:\nnumber): number {\n    if (this.canReturnFloat()) {\n      return value;\n    }\n    return Math.round(value);\n  }\n}\n
```



```

nextValue() {\n  return this.convertValue(this.min + this.range * this.random());\n } }\n\nexport function
jarqueBeraNormalityTest(values: TypedArray|number[]) {\n //
https://en.wikipedia.org/wiki/Jarque%E2%80%93Bera_test\n  const n = values.length;\n  const s =
skewness(values);\n  const k = kurtosis(values);\n  const jb = n / 6 * (Math.pow(s, 2) + 0.25 * Math.pow(k - 3, 2));\n
// JB test requires 2-degrees of freedom from Chi-Square @ 0.95:\n //
http://www.itl.nist.gov/div898/handbook/eda/section3/eda3674.htm\n  const CHI_SQUARE_2DEG = 5.991;\n  if
(jb > CHI_SQUARE_2DEG) {\n    throw new Error(`Invalid p-value for JB: ${jb}`);\n  } }\n\nexport function
expectArrayInMeanStdRange(\n  actual: TypedArray|number[], expectedMean: number, expectedStdDev:
number,\n  epsilon?: number) {\n  if (epsilon === null) {\n    epsilon = testEpsilon();\n  }\n  const actualMean =
mean(actual);\n  expectNumbersClose(actualMean, expectedMean, epsilon);\n  expectNumbersClose(\n
standardDeviation(actual, actualMean), expectedStdDev, epsilon);\n }\n\nfunction mean(values:
TypedArray|number[]) {\n  let sum = 0;\n  for (let i = 0; i < values.length; i++) {\n    sum += values[i];\n  }\n  return
sum / values.length;\n }\n\nfunction standardDeviation(values: TypedArray|number[], mean: number) {\n  let
squareDiffSum = 0;\n  for (let i = 0; i < values.length; i++) {\n    const diff = values[i] - mean;\n    squareDiffSum
+= diff * diff;\n  }\n  return Math.sqrt(squareDiffSum / values.length);\n }\n\nfunction kurtosis(values:
TypedArray|number[]) {\n // https://en.wikipedia.org/wiki/Kurtosis\n  const valuesMean = mean(values);\n  const n
= values.length;\n  let sum2 = 0;\n  let sum4 = 0;\n  for (let i = 0; i < n; i++) {\n    const v = values[i] -
valuesMean;\n    sum2 += Math.pow(v, 2);\n    sum4 += Math.pow(v, 4);\n  }\n  return (1 / n) * sum4 / Math.pow((1
/ n) * sum2, 2);\n }\n\nfunction skewness(values: TypedArray|number[]) {\n //
https://en.wikipedia.org/wiki/Skewness\n  const valuesMean = mean(values);\n  const n = values.length;\n  let sum2
= 0;\n  let sum3 = 0;\n  for (let i = 0; i < n; i++) {\n    const v = values[i] - valuesMean;\n    sum2 += Math.pow(v,
2);\n    sum3 += Math.pow(v, 3);\n  }\n  return (1 / n) * sum3 / Math.pow((1 / (n - 1)) * sum2, 3 / 2);\n }\n\n", "/*\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Tensor} from './tensor';\nimport {Rank, ShapeMap} from './types';\nimport {buffer} from
'/buffer';\nimport {op} from './operation';\nimport {RandGamma} from './rand_util';\n\n/**\n * Creates a `tf.Tensor`
with values sampled from a gamma distribution.\n *\n * ```js\n * tf.randomGamma([2, 2], 1).print();\n * ```\n *\n *
@param shape An array of integers defining the output tensor shape.\n * @param alpha The shape parameter of the
gamma distribution.\n * @param beta The inverse scale parameter of the gamma distribution. Defaults\n * to 1.\n *
@param dtype The data type of the output. Defaults to float32.\n * @param seed The seed for the random number
generator.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n *\nfunction randomGamma<R extends
Rank>(\n  shape: ShapeMap[R], alpha: number, beta = 1,\n  dtype: 'float32'|'int32' = 'float32', seed?: number):
Tensor<R>\n  if (beta === null) {\n    beta = 1;\n  }\n  if (dtype === null) {\n    dtype = 'float32';\n  }\n  if (dtype !==
'float32' && dtype !== 'int32') {\n    throw new Error(`Unsupported data type ${dtype}`);\n  }\n  const rgamma =
new RandGamma(alpha, beta, dtype, seed);\n  const res = buffer(shape, dtype);\n  for (let i = 0; i < res.values.length;
i++) {\n    res.values[i] = rgamma.nextValue();\n  }\n  return res.toTensor();\n }\n\nexport const randomGamma =
op({randomGamma_});\n\n", "/*\n *
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====
*\n\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\n\nimport {buffer}
from './buffer';\nimport {op} from './operation';\nimport {MPRandGauss} from './rand_util';\n\n/**\n * Creates a
`tf.Tensor` with values sampled from a normal distribution.\n *\n * ```js\n * tf.randomNormal([2, 2]).print();\n *
```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param mean The mean of the
normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param dtype The
data type of the output.\n * @param seed The seed for the random number generator.\n *\n * @doc {heading:
'Tensors', subheading: 'Random'}\n *\nfunction randomNormal_<R extends Rank>(\n shape: ShapeMap[R], mean
= 0, stdDev = 1, dtype?: 'float32'|'int32',\n seed?: number): Tensor<R> {\n if (dtype != null && (dtype as
DataType) !== 'bool') {\n throw new Error(`Unsupported data type ${dtype}`);\n }\n const randGauss =\n new MPRandGauss(mean, stdDev, dtype, false /* truncated */, seed);\n const res = buffer(shape, dtype);\n for (let i
= 0; i < res.values.length; i++) {\n res.values[i] = randGauss.nextValue();\n }\n return
res.toTensor();\n}\n\nexport const randomNormal = op({randomNormal_});\n\n"/**\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {Tensor} from './tensor';\nimport {DataType, Rank, ShapeMap} from './types';\n\nimport {buffer}
from './buffer';\nimport {op} from './operation';\nimport {UniformRandom} from './rand_util';\n\n/**\n * Creates a
`tf.Tensor` with values sampled from a uniform distribution.\n *\n * The generated values follow a uniform
distribution in the range [minval,\n * maxval). The lower bound minval is included in the range, while the upper\n *
bound maxval is excluded.\n *\n * ```js\n * tf.randomUniform([2, 2]).print();\n *
```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param minval The lower bound on the range of random values to
generate.\n * Defaults to 0.\n * @param maxval The upper bound on the range of random values to generate.\n *
Defaults to 1.\n * @param dtype The data type of the output tensor. Defaults to 'float32'. \n *\n * @doc {heading:
'Tensors', subheading: 'Random'}\n *\nfunction randomUniform_<R extends Rank>(\n  shape: ShapeMap[R],
minval = 0, maxval = 1, dtype: DataType = 'float32',\n  seed?: number|string): Tensor<R> {\n  const res =
buffer(shape, dtype);\n  const random = new UniformRandom(minval, maxval, null, seed);\n  for (let i = 0; i <
res.values.length; i++) {\n    res.values[i] = random.nextValue();\n  }\n  return res.toTensor();\n}\n\nexport const
randomUniform = op({randomUniform_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {Range, RangeAttrs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {TensorID} from './tensor';\n\n/**\n * Creates a new
`tf.TensorID` filled with the numbers in the range provided.\n *\n * The tensor is a is half-open interval meaning it
includes start, but\n * excludes stop. Decrementing ranges and negative step values are also\n * supported.\n *\n *
```js\n * tf.range(0, 9, 2).print();\n *
```\n *\n * @param start An integer start value\n * @param stop An integer stop value\n * @param step An integer increment (will default to 1 or -1)\n * @param dtype The data type
of the output tensor. Defaults to 'float32'. \n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\nfunction range(\n  start: number, stop: number, step = 1,\n  dtype: 'float32'|'int32' = 'float32'): TensorID {\n  if

```

```
(step === 0) {\n  throw new Error('Cannot have a step of zero');\n }\n\n const attrs: RangeAttrs = {start, stop,\n step, dtype};\n\n return ENGINE.runKernel(Range, { /* inputs */,\n attrs as {}} as NamedAttrMap);\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from '../engine';\nimport {Real, RealInputs} from '../kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns the\n real part of a complex (or real) tensor.\n *\n * Given a tensor input, this operation returns a tensor of type float that\n is\n * the real part of each element in input considered as a complex number.\n *\n * If the input is real, it simply\n makes a clone.\n *\n * ``js\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.real(x).print();\n * ``\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\n\nfunction real<T extends Tensor>(input: T|TensorLike): T {\n  const $input = convertToTensor(input, 'input', 'real');\n\n  const inputs: RealInputs = {input: $input};\n  return ENGINE.runKernel(Real, inputs as {}} as NamedTensorMap);\n}\n\nexport const real = op({real_});\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from '../engine';\nimport {Reciprocal, ReciprocalInputs} from '../kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes\n reciprocal of x element-wise:  $1 / x$ \n *\n * ``js\n * const x = tf.tensor1d([0, 1, 2]);\n * x.reciprocal().print(); //\n or tf.reciprocal(x)\n * ``\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic\n math'}\n */\n\nfunction reciprocal<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x',\n 'reciprocal');\n\n  const inputs: ReciprocalInputs = {x: $x};\n  return ENGINE.runKernel(Reciprocal, inputs as {}} as\n NamedTensorMap);\n}\n\nexport const reciprocal = op({reciprocal_});\n\n"/**\n * @license\n * Copyright 2020\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS"\n BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from '../engine';\nimport {Relu, ReluInputs} from '../kernel_names';\nimport {Tensor}\n from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes\n rectified linear element-wise:  $\\max(x, 0)$ \n *\n * ``js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n * x.relu().print(); //\n or tf.relu(x)\n * ``\n *\n * @param x The input tensor. If the dtype is `bool`, the output dtype will\n be\n * `int32`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic\n math'}\n */\n\nfunction relu<T extends\n Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'relu');\n\n  const inputs: ReluInputs = {x:\n $x};\n\n  return ENGINE.runKernel(Relu, inputs as {}} as NamedTensorMap);\n}\n\nexport const relu =
```

op({relu_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Relu6, Relu6Inputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes rectified linear 6 element-wise:  $\min(\max(x, 0), 6)$ .  
 * const x = tf.tensor1d([-1, 2, -3, 8]);  
 * x.relu6().print(); // or tf.relu6(x)  
 * @param x The input tensor. If the dtype is `bool`, the output dtype will be `int32`.  
 * @doc {heading: 'Operations', subheading: 'Basic math'}\n *\nfunction relu6_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'relu6');\n  const inputs: Relu6Inputs = {x: $x};\n  return ENGINE.runKernel(Relu6, inputs as {} as NamedTensorMap);\n}\n\nexport const relu6 = op({relu6_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Reverse, ReverseAttrs, ReverseInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Reverses a `tf.Tensor` along a specified axis.  
 * Also available are stricter rank-specific methods that assert that `x` is of the given rank:  
 * - tf.reverse1d  
 * - tf.reverse2d  
 * - tf.reverse3d  
 * - tf.reverse4d  
 * Except tf.reverse1d (which does not have axis param), all methods have same signature as this method.  
 * const x = tf.tensor1d([1, 2, 3, 4]);  
 * x.reverse().print();  
 * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);  
 * const axis = 1;  
 * x.reverse(axis).print();  
 * @param x The input tensor to be reversed.  
 * @param axis The set of dimensions to reverse. Must be in the range [-rank(x), rank(x)]. Defaults to all axes.  
 * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n *\nfunction reverse_<T extends Tensor>(x: T|TensorLike, axis?: number|number[]): T {\n  const $x = convertToTensor(x, 'x', 'reverse');\n  const inputs: ReverseInputs = {x: $x};\n  const attrs: ReverseAttrs = {dims: axis};\n  return ENGINE.runKernel(Reverse, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const reverse = op({reverse_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor1D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {op} from './operation';\nimport {reverse} from
```

```

./reverse';\n\n/*\n * Reverses a `tf.Tensor1D`. \n * \n * @param x The input tensor.\n */\nfunction reverse1d(x:\nTensor1D|TensorLike): Tensor1D {\n  const $x = convertToTensor(x, 'x', 'reverse');\n  util.assert(\n    $x.rank ===\n    1,\n    () => `Error in reverse1D: x must be rank 1 but got rank ${$x.rank}.`);\n  return reverse($x, 0);\n}\n\nexport\nconst reverse1d = op({reverse1d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */

```

```

=====\n\n*\n\nimport {Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n{TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/*\n * Reverses a `tf.Tensor2D` along a specified axis.\n * \n * @param x The input tensor.\n * \n * @param axis The set of dimensions to reverse. Must be in the\n *   range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse2d(x: Tensor2D|TensorLike, axis?: number|number[]): Tensor2D {\n  const $x =\n  convertToTensor(x, 'x', 'reverse');\n  util.assert(\n    $x.rank === 2,\n    () => `Error in reverse2D: x must be rank 2\n    but got rank ${$x.rank}.`);\n  return reverse($x, axis);\n}\n\nexport const reverse2d = op({reverse2d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\n*\n\nimport {Tensor3D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n{TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/*\n * Reverses a `tf.Tensor3D` along a specified axis.\n * \n * @param x The input tensor.\n * \n * @param axis The set of dimensions to reverse. Must be in the\n *   range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse3d(x: Tensor3D|TensorLike, axis?: number|number[]): Tensor3D {\n  const $x =\n  convertToTensor(x, 'x', 'reverse');\n  util.assert(\n    $x.rank === 3,\n    () => `Error in reverse3D: x must be rank 3\n    but got rank ${$x.rank}.`);\n  return reverse($x, axis);\n}\n\nexport const reverse3d = op({reverse3d_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n\n*\n\nimport {Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n{TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reverse} from\n './reverse';\n\n/*\n * Reverses a `tf.Tensor4D` along a specified axis.\n * \n * @param x The input tensor.\n * \n * @param axis The set of dimensions to reverse. Must be in the\n *   range [-rank(x), rank(x)]. Defaults to all axes.\n */\nfunction reverse4d(x: Tensor4D|TensorLike, axis?: number|number[]): Tensor4D {\n  const $x =\n  convertToTensor(x, 'x', 'reverse');\n  util.assert(\n    $x.rank === 4,\n    () => `Error in reverse4D: x must be rank 4\n    but got rank ${$x.rank}.`);\n  return reverse($x, axis);\n}\n\nexport const reverse4d = op({reverse4d_});\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a

```

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```
=====
*/
import {ENGINE} from './engine';
import {Round, RoundInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';

/**
 * Computes round of input `tf.Tensor` element-wise: `round(x)`.
 * It implements banker's rounding.
 *
 * ```js
 * const x = tf.tensor1d([6, 1.1, -3.3]);
 * x.round().print(); // or tf.round(x)
 * @param x The input tensor.
 * @doc {heading: 'Operations', subheading: 'Basic math'}
 */
function round_<T extends Tensor>(x: T|TensorLike): T {
  const $x = convertToTensor(x, 'x', 'round');
  const inputs: RoundInputs = {x: $x};
  return ENGINE.runKernel(Round, inputs as { } as NamedTensorMap);
}
export const round = op({round_});

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 */
```

```
=====
*/
import {ENGINE} from './engine';
import {Rsqrt, RsqrtInputs} from './kernel_names';
import {Tensor} from './tensor';
import {NamedTensorMap} from './tensor_types';
import {convertToTensor} from './tensor_util_env';
import {TensorLike} from './types';
import {op} from './operation';

/**
 * Computes reciprocal of square root of the input `tf.Tensor` element-wise:
 *  $y = 1 / \sqrt{x}$ 
 *
 * ```js
 * const x = tf.tensor1d([1, 2, 4, -1]);
 * x.rsqrt().print(); // or tf.rsqrt(x)
 * @param x The input tensor.
 * @doc {heading: 'Operations', subheading: 'Basic math'}
 */
function rsqrt_<T extends Tensor>(x: T|TensorLike): T {
  const $x = convertToTensor(x, 'x', 'rsqrt');
  const inputs: RsqrtInputs = {x: $x};
  return ENGINE.runKernel(Rsqrt, inputs as { } as NamedTensorMap);
}
export const rsqrt = op({rsqrt_});

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 */
```

```
=====
*/
import {Scalar} from './tensor';
import {DataType} from './types';
import {isTypedArray} from './util';
import {makeTensor} from './tensor_ops_util';

/**
 * Creates rank-0 `tf.Tensor` (scalar) with the provided value and dtype.
 * The same functionality can be achieved with `tf.tensor`, but in general we recommend using `tf.scalar` as it makes the code more readable.
 *
 * ```js
 * tf.scalar(3.14).print();
 * @param value The value of the scalar.
 * @param dtype The data type.
 * @doc {heading: 'Tensors', subheading: 'Creation'}
 */
export function scalar(value: number|boolean|string|Uint8Array, dtype?: DataType): Scalar {
  if (((isTypedArray(value) && dtype !== 'string') || Array.isArray(value)) && dtype !== 'complex64') {
    throw new Error(`Error creating a new Scalar: value must be a primitive +\n (number|boolean|string)`);
  }
  if (dtype === 'string' && isTypedArray(value) && !(value instanceof Uint8Array)) {
    throw new Error(`When making a scalar from encoded string, +\n the value must be Uint8Array.`);
  }
  const shape: number[] = [];
  const inferredShape: number[] = [];
  return makeTensor(value, shape, inferredShape, dtype) as Scalar;
}

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 */
```

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {Selu, SeluInputs} from './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes scaled exponential linear element-wise.\n *  $x < 0 ? scale * alpha * (exp(x) - 1) : x$ \n * tf.tensor1d([-1, 2, -3, 4]);\n * x.selu().print(); // or tf.selu(x)\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction selu<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'selu');\n  const inputs: SeluInputs = {x: $x};\n  return ENGINE.runKernel(Selu, inputs as {} as NamedTensorMap);\n}\n\nexport const selu = op({selu_});\n\n\n=====\n*\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {conv2d} from './conv2d';\nimport {depthwiseConv2d} from './depthwise_conv2d';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * 2-D convolution with separable filters.\n * Performs a depthwise convolution that acts separately on channels followed by a pointwise convolution that mixes channels. Note that this is separability between dimensions [1, 2] and 3, not spatial separability between dimensions 1 and 2.\n * See [https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d](https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d) for more details.\n * @param x The input tensor, of rank 4 or rank 3, of shape [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param depthwiseFilter The depthwise filter tensor, rank 4, of shape [filterHeight, filterWidth, inChannels, channelMultiplier]. This is the filter used in the first step.\n * @param pointwiseFilter The pointwise filter tensor, rank 4, of shape [1, 1, inChannels * channelMultiplier, outChannels]. This is the filter used in the second step.\n * @param strides The strides of the convolution: [strideHeight, strideWidth]. If strides is a single number, then strideHeight == strideWidth.\n * @param pad The type of padding algorithm. - 'same' and stride 1: output will be of same size as input, regardless of filter size. - 'valid': output will be smaller than input if filter is larger than 1x1. - For more info, see this guide: [https://www.tensorflow.org/api_guides/python/nn#Convolution](https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: [dilationHeight, dilationWidth] in which we sample input values across the height and width dimensions in atrous convolution. Defaults to [1, 1]. If 'rate' is a single number, then dilationHeight == dilationWidth. If it is greater than 1, then all values of 'strides' must be 1.\n * @param dataType: An optional string from: \"NHWC\", \"NCHW\". Defaults to \"NHWC\". Specify the data format of the input and output data. With the default format \"NHWC\", the data is stored in the order of: [batch, height, width, channels]. Only \"NHWC\" is currently supported.\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction separableConv2d<T extends Tensor3D|Tensor4D>(x: T|TensorLike, depthwiseFilter: Tensor4D|TensorLike, pointwiseFilter: Tensor4D|TensorLike, strides: [number, number]|number, pad: 'valid'|'same', dilation: [number, number]|number = [1, 1], dataType: string): T {\n  const $x = convertToTensor(x, 'x', 'separableConv2d');\n  const inputs: SeparableConv2dInputs = {x: $x, depthwiseFilter, pointwiseFilter, strides, pad, dilation, dataType};\n  return ENGINE.runKernel(SeparableConv2d, inputs as {} as NamedTensorMap);\n}\n\nexport const separableConv2d = op({separableConv2d_});\n\n\n=====\n*\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```

'NHWC'|'NCHW' = 'NHWC'): T {\n  const $x = convertToTensor(x, 'x', 'separableConv2d');\n  const
$depthwiseFilter =\n    convertToTensor(depthwiseFilter, 'depthwiseFilter', 'separableConv2d');\n  const
$pointwiseFilter =\n    convertToTensor(pointwiseFilter, 'pointwiseFilter', 'separableConv2d');\n\n  let x4D = $x as
Tensor4D;\n  let reshapedTo4D = false;\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1,
$x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n\n  if (dataFormat === 'NCHW') {\n    throw new Error(\n
'separableConv2d currently does not support dataFormat NCHW; only ' +\n    'NHWC is supported');\n  }\n\n  util.assert(\n
x4D.rank === 4,\n    () => `Error in separableConv2d: input must be rank 4, but got ` +\n
`rank ${x4D.rank}.`);\n  util.assert(\n    $depthwiseFilter.rank === 4,\n    () => `Error in separableConv2d:
depthwise filter must be rank 4, but ` +\n    `got rank ${$depthwiseFilter.rank}.`);\n  util.assert(\n
$pointwiseFilter.rank === 4,\n    () => `Error in separableConv2d: pointwise filter must be rank 4, but ` +\n
`got rank ${$depthwiseFilter.rank}.`);\n  util.assert(\n    $pointwiseFilter.shape[0] === 1,\n    () =>\n
`Error in separableConv2d: the first dimension of pointwise filter ` +\n
`must be 1, but got
${$pointwiseFilter.shape[0]}.`);\n  util.assert(\n    $pointwiseFilter.shape[1] === 1,\n    () => `Error in
separableConv2d: the second dimension of pointwise ` +\n
`filter must be 1, but got
${$pointwiseFilter.shape[1]}.`);\n\n  const inChannels = $depthwiseFilter.shape[2];\n  const channelMultiplier =
$depthwiseFilter.shape[3];\n  util.assert(\n    $pointwiseFilter.shape[2] === inChannels * channelMultiplier,\n    ()
=>\n    `Error in separableConv2d: the third dimension of pointwise filter ` +\n
`must be ${inChannels *
channelMultiplier}, ` +\n
`but got ${$pointwiseFilter.shape[2]}.`);\n\n  const depthwise = depthwiseConv2d(\n
x4D, $depthwiseFilter, strides, pad, dataFormat, dilation);\n  const pointwiseStride = 1;\n  const res =\n  conv2d(depthwise, $pointwiseFilter, pointwiseStride, 'valid', dataFormat);\n\n  if (reshapedTo4D) {\n    return
reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  }\n  return res as T;\n}\n\nexport const
separableConv2d = op({separableConv2d_});\n\n"/**\n * @license\n * Copyright 2020 Google Inc. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n
*/\nimport {Tensor, TensorBuffer} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\n\n/**\n * Computes the difference between two lists of
numbers.\n * Given a Tensor `x` and a Tensor `y`, this operation returns a Tensor `out`\n * that represents all
values that are in `x` but not in `y`. The returned\n * Tensor `out` is sorted in the same order that the numbers appear
in `x`\n * (duplicates are preserved). This operation also returns a Tensor indices that\n * represents the position of
each out element in `x`. In other words:\n * `out[i] = x[idx[i]]` for i in [0, 1, ..., out.length - 1]\n *
const x = [1, 2, 3, 4, 5, 6];\n * const y = [1, 3, 5];\n * const [out, indices] = await tf.setdiff1dAsync(x, y);\n *
out.print(); // [2, 4, 6]\n * indices.print(); // [1, 3, 5]\n * @param x 1-D Tensor. Values to keep.\n *
@param y 1-D Tensor. Must have the same type as x. Values to exclude in the\n * output.\n * @returns Promise
of Tensor tuple [out, indices].\n * out: Tensor with the same type as x.\n * indices: A Tensor of type int32.\n *
@doc {heading: 'Tensors', subheading: 'Transformations'}\n */\n\n@async function setdiff1dAsync(\n  x:\n  Tensor|TensorLike, y: Tensor|TensorLike): Promise<[Tensor, Tensor]> {\n  const $x = convertToTensor(x, 'x',
'setdiff1d');\n  const $y = convertToTensor(y, 'y', 'setdiff1d');\n\n  util.assert(\n    $x.dtype === $y.dtype,\n    () =>
`x and y should have the same dtype, but got x (${ $x.dtype}) and y (${ $y.dtype}).`);\n\n  util.assert(\n
$x.rank === 1, () => `x should be 1D tensor, but got x (${ $x.shape}).`);\n\n  util.assert(\n    $y.rank === 1, () => `y
should be 1D tensor, but got y (${ $y.shape}).`);\n\n  const xVals = await $x.data();\n  const yVals = await
$y.data();\n  const ySet = new Set(yVals);\n\n  let outputSize = 0;\n  for (let i = 0; i < xVals.length; i++) {\n
if (!ySet.has(xVals[i])) {\n    outputSize++;\n  }\n}\n\n  const buffer = new TensorBuffer([outputSize],
$x.dtype);\n  const indices = new TensorBuffer([outputSize], 'int32');\n  for (let i = 0, p = 0; i < xVals.length; i++)

```



```
{\n  if (!ySet.has(xVals[i])) {\n    buffer.values[p] = xVals[i];\n    indices.values[p] = i;\n    p++;\n  }\n}\nreturn [buffer.toTensor(), indices.toTensor()];\n}\n\nexport const setdiff1dAsync = setdiff1dAsync_;\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n  copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n  the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {Sign, SignInputs} from './kernel_names';\nimport {Tensor}\n  from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n  './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Returns an\n  element-wise indication of the sign of a number.\n *\n *`js`\n * const x = tf.tensor1d([.6, 1.1, -3.3, NaN, 0]);\n *\n * x.sign().print(); // or tf.sign(x)\n *\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',\n  subheading: 'Basic math'}\n */\nfunction sign_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n    convertToTensor(x, 'x', 'sign');\n  const inputs: SignInputs = {x: $x};\n  return ENGINE.runKernel(Sign, inputs as\n    {} as NamedTensorMap);\n}\n\nexport const sign = op({sign_});\n", "/*\n * @license\n * Copyright 2018 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\n  use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {Sin, SinInputs} from './kernel_names';\nimport {Tensor} from\n  './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n  './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes sin\n  of the input Tensor element-wise: `sin(x)`\n *\n *`js`\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 / 4]);\n *\n * x.sin().print(); // or tf.sin(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',\n  subheading: 'Basic math'}\n */\nfunction sin_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n    convertToTensor(x, 'x', 'sin');\n  const inputs: SinInputs = {x: $x};\n  return ENGINE.runKernel(Sin, inputs as\n    {} as NamedTensorMap);\n}\n\nexport const sin = op({sin_});\n", "/*\n * @license\n * Copyright 2018 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n  file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {Sinh, SinhInputs} from './kernel_names';\nimport {Tensor}\n  from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from\n  './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes\n  hyperbolic sin of the input `tf.Tensor` element-wise: `sinh(x)`\n *\n *`js`\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.sinh().print(); // or tf.sinh(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',\n  subheading: 'Basic math'}\n */\nfunction sinh_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =\n    convertToTensor(x, 'x', 'sinh');\n  const inputs: SinhInputs = {x: $x};\n  return ENGINE.runKernel(Sinh, inputs as\n    {} as NamedTensorMap);\n}\n\nexport const sinh = op({sinh_});\n", "/*\n * @license\n * Copyright 2018 Google\n  LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
```

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Tensor1D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 1D slice from 1D array starting at coordinates `begin` and is\n * of length `size`. See\n `slice` for details.\n *\nfunction slice1d_(\n  x: Tensor1D|TensorLike, begin: number, size: number): Tensor1D {\n  const $x = convertToTensor(x, 'x', 'slice1d');\n  util.assert(\n    $x.rank === 1,\n    () =>\n      `slice1d expects a\n rank-1 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x, [begin], [size]);\n}\n\nexport const slice1d =\n  op({slice1d_});\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n*\n\nimport {Tensor2D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 2D slice from a 2D array starting at coordinates `begin` and\n * is of size `size`. See\n `slice` for details.\n *\nfunction slice2d_(\n  x: Tensor2D|TensorLike, begin: [number, number],\n  size: [number,\n number]): Tensor2D {\n  const $x = convertToTensor(x, 'x', 'slice2d');\n  util.assert(\n    $x.rank === 2,\n    ()\n =>\n      `slice2d expects a rank-2 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x, begin,\n size);\n}\n\nexport const slice2d = op({slice2d_});\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor3D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport\n{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from\n './slice';\n\n/**\n * Extracts a 3D slice from a 3D array starting at coordinates `begin` and\n * is of size `size`. See\n `slice` for details.\n *\nfunction slice3d_(\n  x: Tensor3D|TensorLike, begin: [number, number, number],\n  size: [number, number, number]): Tensor3D {\n  const $x = convertToTensor(x, 'x', 'slice3d');\n  util.assert(\n    $x.rank\n === 3,\n    () =>\n      `slice3d expects a rank-3 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x,\n begin, size);\n}\n\nexport const slice3d = op({slice3d_});\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
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*\n\nimport {Tensor4D} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {op} from './operation';\nimport {slice} from
 './slice';\n\n/**\n * Extracts a 4D slice from a 4D array starting at coordinates `begin` and\n * is of size `size`. See
 `slice` for details.\n *\nfunction slice4d_(\n  x: Tensor4D|TensorLike, begin: [number, number, number,
number],\n  size: [number, number, number, number]): Tensor4D {\n  const $x = convertToTensor(x, 'x',
'slice4d');\n  util.assert(\n    $x.rank === 4,\n    () =>\n      `slice4d expects a rank-4 tensor, but got a rank-
${$x.rank} tensor`);\n  return slice($x, begin, size);\n}\n\nexport const slice4d = op({slice4d_});\n", "/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {ENGINE} from './engine';\nimport {Softmax, SoftmaxAttrs, SoftmaxInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
{NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n *\n * Computes the softmax normalized vector
given the logits.\n *\n * ``js\n * const a = tf.tensor1d([1, 2, 3]);\n * a.softmax().print(); // or tf.softmax(a)\n *
``\n *\n * ``js\n * const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n * a.softmax().print(); // or tf.softmax(a)\n *
``\n *\n * @param logits The logits array.\n * @param dim The dimension softmax would be performed on.
Defaults to -1\n * which indicates the last dimension.\n *\n * @doc {heading: 'Operations', subheading:
'Normalization'}\n *\nfunction softmax_<T extends Tensor>(logits: T|TensorLike, dim = -1): T {\n  const $logits =
convertToTensor(logits, 'logits', 'softmax', 'float32');\n\n  if (dim === -1) {\n    dim = $logits.rank - 1;\n  }\n  if (dim
!== $logits.rank - 1) {\n    throw Error(\n      'Softmax along a non-last dimension is not yet supported.' +\n
`Logits was rank ${$logits.rank} and dim was ${dim}`);\n  }\n\n  const inputs: SoftmaxInputs = {logits: $logits};\n
const attrs: SoftmaxAttrs = {dim};\n\n  return ENGINE.runKernel(\n    Softmax, inputs as {} as
NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const softmax = op({softmax_});\n", "/**\n *
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====

```

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*\n\nimport {ENGINE} from './engine';\nimport {FFT, FFTInputs} from './kernel_names';\nimport {Tensor}
from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {assert} from './util';\nimport
{op} from './operation';\n\n/**\n *\n * Fast Fourier transform.\n *\n * Computes the 1-dimensional discrete Fourier
transform over the inner-most\n * dimension of input.\n *\n * ``js\n * const real = tf.tensor1d([1, 2, 3]);\n * const
imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n * x.fft().print(); // tf.spectral.fft(x).print();\n *
``\n *\n * @param input The complex input to compute an fft over.\n *\n * @doc {heading: 'Operations', subheading:
'Spectral', namespace: 'spectral'}\n *\nfunction fft_(input: Tensor): Tensor {\n  assert(\n    input.dtype ===
'complex64',\n    () => `The dtype for tf.spectral.fft() must be complex64` +\n      `but got ${input.dtype}.`);\n\n  const inputs: FFTInputs = {input};\n\n  return ENGINE.runKernel(FFT, inputs as {} as
NamedTensorMap);\n}\n\nexport const fft = op({fft_});\n", "/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {IFFT, IFFTInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {assert} from '../util';\nimport {op} from '../operation';\n\n/**\n * Inverse fast Fourier transform.\n *\n * Computes the inverse 1-dimensional discrete Fourier transform over the\n * inner-most dimension of input.\n *\n *`js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n *\n * x.ifft().print(); //\ntf.spectral.ifft(x).print();\n *`*\n * @param input The complex input to compute an ifft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n *\nfunction ifft_(input: Tensor): Tensor {\n  assert(\n    input.dtype === 'complex64',\n    () => `The dtype for tf.spectral.ifft() must be complex64` +\n    `but got ${input.dtype}.`);\n\n  const inputs: IFFTInputs = {input};\n\n  return ENGINE.runKernel(IFFT, inputs as\n  {} as NamedTensorMap);\n}\n\nexport const ifft = op({ifft_});\n",/***\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor, Tensor2D} from '../tensor';\nimport {complex} from '../complex';\nimport {concat} from '../concat';\nimport {imag} from './imag';\nimport {mul} from './mul';\nimport {op} from '../operation';\nimport {real} from './real';\nimport {reshape} from './reshape';\nimport {reverse} from './reverse';\nimport {scalar} from './scalar';\nimport {slice} from './slice';\nimport {ifft} from './ifft';\n\n/**\n * Inversed real value input fast Fourier transform.\n *\n * Computes the 1-dimensional inversed discrete Fourier transform over the\n * inner-most dimension of the real input.\n *\n *`js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([0, 0, 0]);\n * const x = tf.complex(real, imag);\n *\n * x.irfft().print();\n *`*\n * @param input The real value input to compute an irfft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n *\nfunction irfft_(input: Tensor): Tensor {\n  const innerDimensionSize = input.shape[input.shape.length - 1];\n  const batch = input.size / innerDimensionSize;\n  let ret: Tensor;\n  if (innerDimensionSize <= 2) {\n    const complexInput = reshape(input, [batch, innerDimensionSize]);\n    ret = ifft(complexInput);\n  } else {\n    // The length of unique components of the DFT of a real-valued signal\n    // is 2 * (input_len - 1)\n    const outputShape = [batch, 2 * (innerDimensionSize - 1)];\n    const realInput = reshape(real(input), [batch, innerDimensionSize]);\n    const imagInput = reshape(imag(input), [batch, innerDimensionSize]);\n\n    const realConjugate =\n      reverse(slice(realInput, [0, 1], [batch, innerDimensionSize - 2], 1));\n    const imagConjugate: Tensor2D = mul(\n      reverse(slice(imagInput, [0, 1], [batch, innerDimensionSize - 2], 1),\n        scalar(-1));\n\n    const r =\n      concat([realInput, realConjugate], 1);\n    const i = concat([imagInput, imagConjugate], 1);\n    const complexInput =\n      reshape(complex(r, i), [outputShape[0], outputShape[1]]);\n    ret = ifft(complexInput);\n  }\n  ret = real(ret);\n  // reshape the result if the input is 3D tensor.\n  if (input.rank === 3 && input.shape[0] !== 0) {\n    const temp = ret;\n    const batch = input.shape[0];\n    ret = reshape(ret, [batch, ret.shape[0] / batch, ret.shape[1]]);\n    temp.dispose();\n  }\n  return ret;\n}\n\nexport const irfft = op({irfft_});\n",/***\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====
*\nimport {ENGINE} from './engine';\nimport {SplitV, SplitVAttrs, SplitVInputs} from './kernel_names';\nimport
{NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from
 './types';\n\nimport {op} from './operation';\n\n/**\n * Splits a `tf.Tensor` into sub tensors.\n * If
`numOrSizeSplits` is a number, splits `x` along dimension `axis` into `numOrSizeSplits` smaller tensors.\n *
Requires that `numOrSizeSplits` evenly divides `x.shape[axis]`.\n * If `numOrSizeSplits` is a number array,
splits `x` into\n * `numOrSizeSplits.length` pieces. The shape of the `i`-th piece has the\n * same size as `x` except
along dimension `axis` where the size is\n * `numOrSizeSplits[i]`.\n * ```\n * const x = tf.tensor2d([1, 2, 3, 4,
5, 6, 7, 8], [2, 4]);\n * const [a, b] = tf.split(x, 2, 1);\n * a.print();\n * b.print();\n *\n * const [c, d, e] = tf.split(x, [1,
2, 1], 1);\n * c.print();\n * d.print();\n * e.print();\n * ```\n *\n * @param x The input tensor to split.\n * @param
numOrSizeSplits Either an integer indicating the number of\n * splits along the axis or an array of integers
containing the sizes of\n * each output tensor along the axis. If a number then it must evenly divide\n *
`x.shape[axis]`; otherwise the sum of sizes must match `x.shape[axis]`.\n * Can contain one -1 indicating that
dimension is to be inferred.\n * @param axis The dimension along which to split. Defaults to 0 (the first\n * dim).\n
*\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n *\nfunction split<T extends Tensor>(\n  x:
Tensor|TensorLike, numOrSizeSplits: number[]|number, axis = 0): T[] {\n  const $x = convertToTensor(x, 'x',
'split');\n\n  const inputs: SplitVInputs = {x: $x};\n  const attr: SplitVAttrs = {numOrSizeSplits, axis};\n\n  return
ENGINE.runKernel(\n    SplitV, inputs as {} as NamedTensorMap,\n    attr as {} as NamedAttrMap) as
{} as T[];\n\n}\n\nexport const split = op({split_});\n\n"/**\n *\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====
*\n\nimport {Tensor} from '././tensor';\nimport {assert} from '././util';\nimport {complex} from
 '././complex';\nimport {concat} from '././concat';\nimport {imag} from '././imag';\nimport {op} from
 '././operation';\nimport {real} from '././real';\nimport {reshape} from '././reshape';\nimport {slice} from
 '././slice';\nimport {split} from '././split';\nimport {zeros} from '././zeros';\nimport {zerosLike} from
 '././zeros_like';\n\nimport {fft} from '././fft';\n\n/**\n * Real value input fast Fourier transform.\n *\n * Computes the
1-dimensional discrete Fourier transform over the\n * inner-most dimension of the real input.\n * ```\n * const
real = tf.tensor1d([1, 2, 3]);\n *\n * real.rfft().print();\n * ```\n *\n * @param input The real value input to compute an
rfft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n *\nfunction
rfft_(input: Tensor, fftLength?: number): Tensor {\n  assert(\n    input.dtype === 'float32',\n    () => `The dtype
for rfft() must be real value but got ${input.dtype}`);\n\n  let innerDimensionSize = input.shape[input.shape.length -
1];\n  const batch = input.size / innerDimensionSize;\n\n  let adjustedInput: Tensor;\n  if (fftLength != null &&
fftLength < innerDimensionSize) {\n    // Need to crop\n    const begin = input.shape.map(v => 0);\n    const size =
input.shape.map(v => v);\n    size[input.shape.length - 1] = fftLength;\n    adjustedInput = slice(input, begin, size);\n
    innerDimensionSize = fftLength;\n  } else if (fftLength != null && fftLength > innerDimensionSize) {\n    // Need
to pad with zeros\n    const zerosShape = input.shape.map(v => v);\n    zerosShape[input.shape.length - 1] =
fftLength - innerDimensionSize;\n    adjustedInput = concat([input, zeros(zerosShape)], input.shape.length - 1);\n
    innerDimensionSize = fftLength;\n  } else {\n    adjustedInput = input;\n  }\n\n  // Complement the input with zero
imaginary numbers.\n  const zerosInput = zerosLike(adjustedInput);\n  const complexInput =\n  reshape(complex(adjustedInput, zerosInput), [batch, innerDimensionSize]);\n\n  const ret = fft(complexInput);\n\n  // Exclude complex conjugations. These conjugations are put symmetrically.\n  const half =
Math.floor(innerDimensionSize / 2) + 1;\n  const realValues = real(ret);\n  const imagValues = imag(ret);\n  const
=====

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realComplexConjugate = split(\n    realValues, [half, innerDimensionSize - half],\n    realValues.shape.length -
1);\n const imagComplexConjugate = split(\n    imagValues, [half, innerDimensionSize - half],\n    imagValues.shape.length - 1);\n\n const outputShape = adjustedInput.shape.slice();\n    outputShape[adjustedInput.shape.length - 1] = half;\n\n return reshape(\n    complex(realComplexConjugate[0],
imagComplexConjugate[0]), outputShape);\n\n\nexport const rfft = op({rfft_});\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {Sqrt, SqrtInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Computes
square root of the input `tf.Tensor` element-wise: `y = sqrt(x)`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 4, -1]);\n
*\n * x.sqrt().print(); // or tf.sqrt(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n */\nfunction sqrt_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
convertToTensor(x, 'x', 'sqrt');\n\n const inputs: SqrtInputs = {x: $x};\n\n return ENGINE.runKernel(Sqrt, inputs as
NamedTensorMap);\n}\n\nexport const sqrt = op({sqrt_});\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */

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=====\n
*\n\nimport {ENGINE} from './engine';\nimport {SquaredDifference, SquaredDifferenceInputs} from
 './kernel_names';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport
 {makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from
 './operation';\n\n/**\n * Returns (a - b) * (a - b) element-wise.\n * Supports broadcasting.\n *\n * ```js\n * const a =
tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.squaredDifference(b).print(); // or
tf.squaredDifference(a, b)\n * ```\n *\n * // Broadcast squared difference a with b.\n * const a =
tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.squaredDifference(b).print(); // or
tf.squaredDifference(a, b)\n * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have
the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction
squaredDifference_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a =
convertToTensor(a, 'a', 'squaredDifference');\n let $b = convertToTensor(b, 'b', 'squaredDifference');\n [$a, $b] =
makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs:
SquaredDifferenceInputs = {a: $a, b: $b};\n const attrs = {};\n\n return ENGINE.runKernel(\n
SquaredDifference, inputs as unknown as NamedTensorMap, attrs);\n}\n\nexport const squaredDifference =
op({squaredDifference_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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```
=====  
*  
* \n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}  
from './types';\nimport {squeezeShape} from './util';\n\nimport {op} from './operation';\nimport {reshape} from  
 './reshape';  
\n\n/**  
 * Removes dimensions of size 1 from the shape of a `tf.Tensor`.  
 *  
 * `js`  
 * const x =  
 tf.tensor([1, 2, 3, 4], [1, 1, 4]);  
 * x.squeeze().print();  
 *  
 * @param x The input tensor to be squeezed.  
 *  
 * @param axis An optional list of numbers. If specified, only  
 *   squeezes the dimensions listed. The dimension  
 *   index starts at 0. It is an error to squeeze a dimension that is not 1.  
 *  
 * @doc {heading: 'Tensors',  
 *   subheading: 'Transformations'}  
 *  
 * \n\nfunction squeeze<T extends Tensor>(x: Tensor|TensorLike, axis?: number[]):  
 T {\n  const $x = convertToTensor(x, 'x', 'squeeze');  
  return reshape($x, squeezeShape($x.shape, axis).newShape)  
  as T;\n}\n\nexport const squeeze = op({squeeze_});  
"/**  
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 * http://www.apache.org/licenses/LICENSE-2.0  
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 * WITHOUT WARRANTIES  
 * OR CONDITIONS OF ANY KIND, either express or implied.  
 * See the License for the specific language  
 * governing permissions and  
 * limitations under the License.  
 */  
=====  
\n
```

```
=====  
*  
* \n\nimport {ENGINE} from './engine';\nimport {Pack, PackAttrs, PackInputs} from './kernel_names';\nimport  
 {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from  
 './tensor_types';\nimport {convertToTensorArray} from './tensor_util_env';\nimport {TensorLike} from  
 './types';  
import * as util from './util';  
import {op} from './operation';  
\n\n/**  
 * Stacks a list of rank-`R`  
 * `tf.Tensor`s into one rank-`(R+1)` `tf.Tensor`.  
 *  
 * `js`  
 * const a = tf.tensor1d([1, 2]);  
 * const b =  
 tf.tensor1d([3, 4]);  
 * const c = tf.tensor1d([5, 6]);  
 * tf.stack([a, b, c]).print();  
 *  
 * @param tensors A  
 * list of tensor objects with the same shape and dtype.  
 *  
 * @param axis The axis to stack along. Defaults to 0 (the first  
 * dim).  
 *  
 * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}  
 *  
 * \n\nfunction stack<T extends  
 Tensor>( tensors: Array<T|TensorLike>, axis = 0): Tensor {\n  const $tensors =  
  convertToTensorArray(tensors, 'tensors', 'stack', 'string_or_numeric');  
  util.assert($tensors.length >= 1, ()  
 => 'Pass at least one tensor to tf.stack');  
  if ($tensors.length > 0) {\n    util.assert(axis <= $tensors[0].rank,  
 () => 'Axis must be <= rank of the tensor');  
  }\n  const inputs: PackInputs = $tensors;\n  const attrs: PackAttrs =  
 {axis};  
  return ENGINE.runKernel(\n    Pack, inputs as {} as NamedTensorMap, attrs as {} as  
 NamedAttrMap);\n}\n\nexport const stack = op({stack_});  
"/**  
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 * WITHOUT WARRANTIES  
 * OR CONDITIONS OF ANY KIND, either express or implied.  
 * See the License for the specific language  
 * governing permissions and  
 * limitations under the License.  
 */  
=====  
\n
```

```
=====  
*  
* \n\nimport {ENGINE} from './engine';\nimport {Step, StepAttrs, StepInputs} from './kernel_names';\nimport  
 {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from  
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from  
 './types';  
import {op} from './operation';  
\n\n/**  
 * Computes step of the input `tf.Tensor` element-wise: `x > 0 ?  
 * 1 : alpha * x`  
 * `js`  
 * const x = tf.tensor1d([0, 2, -1, -3]);  
 * x.step(.5).print(); // or tf.step(x, .5)  
 *  
 * @param x The input tensor.  
 * @param alpha The gradient when input is negative.  
 *  
 * @doc {heading:  
 * 'Operations', subheading: 'Basic math'}  
 *  
 * \n\nfunction step<T extends Tensor>(x: T|TensorLike, alpha = 0.0): T {\n  const $x = convertToTensor(x, 'x', 'step');  
  const inputs: StepInputs = {x: $x};  
  const attrs: StepAttrs =  
 {alpha};  
  return ENGINE.runKernel(\n    Step, inputs as {} as NamedTensorMap, attrs as {} as  
 )  
=====  
\n
```

NamedAttrMap);\n}\nexport const step = op({ step_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {ENGINE} from './engine';\nimport {StridedSlice, StridedSliceAttrs, StridedSliceInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor} from './tensor';\nimport
 {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport
 {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a strided slice of a tensor.\n *\n * Roughly speaking, this op extracts a slice of size (end-begin)/stride from\n * the given input tensor (x). Starting at
 the location specified by begin the\n * slice continues by adding stride to the index until all dimensions are not\n *
 less than end. Note that a stride can be negative, which causes a reverse\n * slice.\n *\n * \`\`\`js\n * const t =
 tf.tensor3d([1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 5, 6, 6, 6],\n * [3, 2, 3]);\n * t.stridedSlice([1, 0, 0], [2, 1, 3], [1, 1,
 1]).print() // [[[3, 3, 3]]]\n * t.stridedSlice([1, 0, 0], [2, 2, 3], [1, 1, 1]).print() // [[[3, 3, 3],\n *
 [4, 4, 4]]]\n * t.stridedSlice([1, -1, 0], [2, -3, 3], [1, -1, 1]).print() // [[[4, 4, 4],\n *
 [3, 3, 3]]]\n *\n * @param x The tensor to stride slice.\n * @param begin The coordinates to start
 the slice from.\n * @param end: The coordinates to end the slice at.\n * @param strides: The size of the slice.\n *
 @param beginMask: If the ith bit of beginMask is set, begin[i] is ignored\n * and the fullest possible range in
 that dimension is used instead.\n * @param endMask: If the ith bit of endMask is set, end[i] is ignored\n * and
 the fullest possible range in that dimension is used instead.\n * @param shrinkAxisMask: a bitmask where bit i
 implies that\n * the ith specification should shrink the dimensionality. begin and end must\n * imply a slice of size 1
 in the dimension.\n *\n * @doc {heading: 'Operations', subheading: 'Slicing and Joining'}\n */\nfunction
 stridedSlice_(\n x: Tensor|TensorLike, begin: number[], end: number[], strides?: number[],\n beginMask = 0,
 endMask = 0, ellipsisMask = 0, newAxisMask = 0,\n shrinkAxisMask = 0): Tensor {\n const $x =
 convertToTensor(x, 'x', 'stridedSlice');\n\n const inputs: StridedSliceInputs = {x: $x};\n const attrs:
 StridedSliceAttrs = {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n
 newAxisMask,\n shrinkAxisMask\n };\n\n return ENGINE.runKernel(\n StridedSlice, inputs as { } as
 NamedTensorMap,\n attrs as { } as NamedAttrMap);\n}\n\nexport const stridedSlice =
op({ stridedSlice_});\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
 License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
 Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
 implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {Tan, TanInputs} from './kernel_names';\nimport {Tensor} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from
 './tensor_util_env';\nimport {TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Computes
 tan of the input `tf.Tensor` element-wise, `tan(x)`\n *\n * \`\`\`js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 /
 4]);\n * x.tan().print(); // or tf.tan(x)\n *\n * @param x The input tensor.\n *\n * @doc {heading:
 'Operations', subheading: 'Basic math'}\n */\nfunction tan_<T extends Tensor>(x: T|TensorLike): T {\n const $x =
 convertToTensor(x, 'x', 'tan');\n\n const inputs: TanInputs = {x: $x};\n\n return ENGINE.runKernel(Tan, inputs as
 { } as NamedTensorMap);\n}\n\nexport const tan = op({ tan_});\n", "/*\n * @license\n * Copyright 2018 Google LLC.
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```


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```
=====\n*\n\nimport {Tensor1D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike1D} from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-1 `tf.Tensor` with the provided values, shape and dtype.\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor1d` as it makes the code more readable.\n * \n * @param values The values of the tensor. Can be array of numbers,\n * or a `TypedArray`.\n * @param dtype The data type.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor1d(values: TensorLike1D, dtype?: DataType): Tensor1D {\n  assertNonNull(values);\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 1) {\n    throw new Error('tensor1d() requires values to be a flat/TypedArray');\n  }\n  const shape: number[] = null;\n  return makeTensor(values, shape, inferredShape, dtype) as Tensor1D;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {Tensor2D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike2D} from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-2 `tf.Tensor` with the provided values, shape and dtype.\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor2d` as it makes the code more readable.\n * \n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. If not provided, it is inferred from\n * `values`.\n * @param dtype The data type.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor2d(\n  values: TensorLike2D, shape?: [number, number],\n  dtype?: DataType): Tensor2D {\n  assertNonNull(values);\n  if (shape != null && shape.length !== 2) {\n    throw new Error('tensor2d() requires shape to have two numbers');\n  }\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 2 && inferredShape.length !== 1) {\n    throw new Error(\n      'tensor2d() requires values to be number[][] or flat/TypedArray');\n  }\n  if (inferredShape.length === 1 && shape == null) {\n    throw new Error(\n      'tensor2d() requires shape to be provided when `values` '+\n      'are a flat/TypedArray');\n  }\n  return makeTensor(values, shape, inferredShape, dtype) as Tensor2D;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n*\n\nimport {Tensor4D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike4D} from './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}
```

```

from './tensor_ops_util';\n\n/**\n * Creates rank-4 `tf.Tensor` with the provided values, shape and dtype.\n * The\n * same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor4d` as it makes\n * the code more readable.\n * ```js\n * // Pass a nested array.\n * tf.tensor4d([[[[1], [2]], [[3], [4]]]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor4d([1, 2, 3, 4], [1, 2, 2, 1]).print();\n * ```\n * @param values The values of the tensor. Can be nested array of numbers,\n *   or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. Optional. If not provided,\n *   it is inferred from `values`.\n * @param dtype The data type.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor4d(\n  values: TensorLike4D, shape?: [number, number, number, number],\n  dtype?: DataType): Tensor4D {\n  assertNonNull(values);\n  if (shape != null && shape.length !== 4) {\n    throw new Error('tensor4d() requires shape\n    to have four numbers');\n  }\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 4\n    && inferredShape.length !== 1) {\n    throw new Error(\n      'tensor4d() requires values to be number[][][] or\n      flat/TypedArray');\n  }\n  if (inferredShape.length === 1 && shape == null) {\n    throw new Error(\n      'tensor4d() requires shape to be provided when `values`\n      + ` ` are a flat array');\n  }\n  return makeTensor(values,\n    shape, inferredShape, dtype) as Tensor4D;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS"\n * BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

```

```

=====\n\nimport {Tensor5D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike5D}\nfrom './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}\nfrom './tensor_ops_util';\n\n/**\n * Creates rank-5 `tf.Tensor` with the provided values, shape and dtype.\n * The\n * same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor5d` as it makes\n * the code more readable.\n * ```js\n * // Pass a nested array.\n * tf.tensor5d([[[[1],[2]],[[3],[4]]],[[5],[6]],[[7],[8]]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a\n * shape.\n * tf.tensor5d([1, 2, 3, 4, 5, 6, 7, 8], [1, 2, 2, 2, 1]).print();\n * ```\n * @param values The values of the\n * tensor. Can be nested array of numbers,\n *   or a flat array, or a `TypedArray`.\n * @param shape The shape of the\n * tensor. Optional. If not provided,\n *   it is inferred from `values`.\n * @param dtype The data type.\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor5d(\n  values: TensorLike5D, shape?:\n  [number, number, number, number, number],\n  dtype?: DataType): Tensor5D {\n  assertNonNull(values);\n  if\n  (shape != null && shape.length !== 5) {\n    throw new Error('tensor5d() requires shape to have five numbers');\n  }\n  const inferredShape = inferShape(values, dtype);\n  if (inferredShape.length !== 5 && inferredShape.length !==\n    1) {\n    throw new Error(\n      'tensor5d() requires values to be '+\n      ` `number[][][] or flat/TypedArray');\n  }\n  if (inferredShape.length === 1 && shape == null) {\n    throw new Error(\n      'tensor5d() requires shape to be\n      provided when `values`\n      + ` ` are a flat array');\n  }\n  return makeTensor(values, shape, inferredShape, dtype) as\n  Tensor5D;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n * Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

```

```

=====\n\nimport {Tensor6D} from './tensor';\nimport {inferShape} from './tensor_util_env';\nimport {TensorLike6D}\nfrom './types';\nimport {DataType} from './types';\nimport {assertNonNull} from './util';\nimport {makeTensor}\nfrom './tensor_ops_util';\n\n/**\n * Creates rank-6 `tf.Tensor` with the provided values, shape and dtype.\n * The\n *

```

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same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor6d` as it makes
the code more readable.\n * \n * ``js\n * // Pass a nested array.\n *
tf.tensor6d([[[[[[1],[2]],[[3],[4]]],[[5],[6]],[[7],[8]]]]]).print();\n * ``\n * ``js\n * // Pass a flat array and specify a
shape.\n * tf.tensor6d([1, 2, 3, 4, 5, 6, 7, 8], [1, 1, 2, 2, 2, 1]).print();\n * ``\n * \n * @param values The values of the
tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the
tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n * \n * @doc
{heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor6d(\n  values: TensorLike6D,\n  shape?:
[number, number, number, number, number, number],\n  dtype?: DataType): Tensor6D {\n
assertNonNull(values);\n if (shape != null && shape.length !== 6) {\n  throw new Error('tensor6d() requires shape
to have six numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 6 &&
inferredShape.length !== 1) {\n  throw new Error(\n    'tensor6d() requires values to be number[][][] or '+\n
'flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n  throw new Error(\n
'tensor6d() requires shape to be provided when `values` '+\n  'are a flat array');\n }\n shape = shape ||\n
inferredShape as [number, number, number, number, number, number];\n return makeTensor(values, shape,
inferredShape, dtype) as Tensor6D;\n }\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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=====\n
*/\n\nimport {ENGINE} from '../engine';\nimport {TopK, TopKAttrs, TopKInputs} from '../kernel_names';\nimport
{NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
../tensor_types;\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
../types;\n\nimport {op} from '../operation';\n\n/**\n * Finds the values and indices of the `k` largest entries along
the last\n * dimension.\n * \n * If the input is a vector (rank=1), finds the k largest entries in the vector\n * and
outputs their values and indices as vectors. Thus values[j] is the j-th\n * largest entry in input, and its index is
indices[j].\n * For higher rank inputs, computes the top k entries along the last dimension.\n * \n * If two elements
are equal, the lower-index element appears first.\n * \n * ``js\n * const a = tf.tensor2d([[1, 5], [4, 3]]);\n * const
{values, indices} = tf.topk(a);\n * values.print();\n * indices.print();\n * ``\n * \n * @param x 1-D or higher `tf.Tensor`
with last dimension being at least `k`.\n * @param k Number of top elements to look for along the last dimension.\n
* @param sorted If true, the resulting `k` elements will be sorted by the\n * values in descending order.\n * \n *
@doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nfunction topk<T extends Tensor>(\n  x:
T|TensorLike, k = 1, sorted = true): {values: T, indices: T} {\n  const $x = convertToTensor(x, 'x', 'topk');\n  if
($x.rank === 0) {\n    throw new Error('topk() expects the input to be of rank 1 or higher');\n  }\n  const lastDim =
$x.shape[$x.shape.length - 1];\n  if (k > lastDim) {\n    throw new Error(\n      `k` passed to topk() must be <= the
last dimension (${lastDim})` +\n      `but got ${k}`);\n  }\n  const inputs: TopKInputs = {x: $x};\n  const attrs:
TopKAttrs = {k, sorted};\n  const [values, indices] = ENGINE.runKernel(\n    TopK, inputs as { } as
NamedTensorMap, attrs as { } as NamedAttrMap);\n  return {values, indices} as {values: T, indices:
T};\n }\n\nexport const topk = op({topk_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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```
=====
*
import {ENGINE} from '../engine';
import {UnsortedSegmentSum, UnsortedSegmentSumAttrs,
UnsortedSegmentSumInputs} from '../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor, TensorID} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from '../types';
import {assert, isInt} from '../util';
import {op} from '../operation';

/**
 * Computes the sum along segments of a `tf.Tensor`.
 *
 * ```js
 * const x = tf.tensor1d([1, 2, 3, 4]);
 * const segmentIds = tf.tensor1d([1, 2, 0, 1], 'int32');
 * const numSegments = 3;
 * x.unsortedSegmentSum(segmentIds, numSegments).print() //
tf.unsortedSegmentSum(x, segmentIds, numSegments)
 *
 * @param x The `tf.Tensor` that will be summed
 * along its segments.
 * @param segmentIds A `tf.TensorID` whose rank is equal to the rank of `x`'s
 * dimension
 * along the `axis`. Maps each element of `x` to a segment.
 * @param numSegments The number of distinct
 * `segmentIds`.
 * @doc {heading: 'Operations', subheading: 'Segment'}
 */
function
unsortedSegmentSum<T extends Tensor>(x: T|TensorLike, segmentIds: TensorID|TensorLike, numSegments:
number): T {
  const $x = convertToTensor(x, 'x', 'unsortedSegmentSum');
  const $segmentIds =
  convertToTensor(segmentIds, 'segmentIds', 'unsortedSegmentSum', 'int32');
  assert(isInt(numSegments), () =>
'numSegments must be of dtype int');
  const inputs: UnsortedSegmentSumInputs = {x: $x, segmentIds:
  $segmentIds};
  const attrs: UnsortedSegmentSumAttrs = {numSegments};
  return ENGINE.runKernel(
  UnsortedSegmentSum, inputs as {} as NamedTensorMap,
  attrs as {} as NamedAttrMap);
}

export const
unsortedSegmentSum = op({unsortedSegmentSum});

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 */
=====
```

```
=====
*
import {ENGINE} from '../engine';
import {Unpack, UnpackAttrs, UnpackInputs} from
 '../kernel_names';
import {NamedAttrMap} from '../kernel_registry';
import {Tensor} from '../tensor';
import {NamedTensorMap} from '../tensor_types';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from '../types';
import * as util from '../util';
import {op} from '../operation';

/**
 * Unstacks a
 * `tf.Tensor` of rank-`R` into a list of rank-`(R-1)` `tf.Tensor`s.
 *
 * ```js
 * const a = tf.tensor2d([1, 2, 3, 4], [2,
  2]);
 * tf.unstack(a).forEach(tensor => tensor.print());
 *
 * @param x A tensor object.
 * @param
 * axis The axis to unstack along. Defaults to 0 (the first dim).
 * @doc {heading: 'Tensors', subheading: 'Slicing
 * and Joining'}
 */
function unstack(x: Tensor|TensorLike, axis = 0): Tensor[] {
  const $x = convertToTensor(x,
  'x', 'unstack', 'string_or_numeric');
  util.assert(
  axis >= -$x.shape.length && axis < $x.shape.length,
  () =>
`Axis = ${axis} is not in [-${$x.shape.length},
  ${$x.shape.length}]`);
  const inputs: UnpackInputs =
  {value: $x};
  const attrs: UnpackAttrs = {axis};
  return ENGINE.runKernel(
  Unpack, inputs as {} as
  NamedTensorMap, attrs as {} as NamedAttrMap);
}

export const unstack = op({unstack});

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 * the specific language governing permissions and
 * limitations under the License.
 */
=====
```

```
=====
*
import {ENGINE} from '../engine';
import {Tensor, Variable} from '../tensor';
import {DataType, Rank}
```

```

from './types';\n\n/**\n * Creates a new variable with the provided initial value.\n * ```js\n * const x =
tf.variable(tf.tensor([1, 2, 3]));\n * x.assign(tf.tensor([4, 5, 6]));\n *\n * x.print();\n * ```\n *\n * @param initialValue
Initial value for the tensor.\n * @param trainable If true, optimizers are allowed to update it.\n * @param name
Name of the variable. Defaults to a unique id.\n * @param dtype If set, initialValue will be converted to the given
type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n *\nexport function variable<R extends Rank>(
initialValue: Tensor<R>, trainable = true, name?: string,\n * dtype?: DataType): Variable<R> {\n * return
ENGINE.makeVariable(initialValue, trainable, name, dtype) as\n * Variable<R>;\n *\n * }\n *"/**\n * @license\n *
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the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\n/**\n * An implementation of the Where kernel shared between cpu and webgl *\n\nimport {buffer} from
 './ops/buffer';\nimport {Tensor2D} from './tensor';\nimport {TypedArray} from './types';\n\nexport function
whereImpl(condShape: number[], condVals: TypedArray): Tensor2D {\n * const indices = [];\n * for (let i = 0; i <
condVals.length; i++) {\n *   if (condVals[i]) {\n *     indices.push(i);\n *   }\n * }\n *\n * const inBuffer =
buffer(condShape, 'int32');\n *\n * const out = buffer([indices.length, condShape.length], 'int32');\n * for (let i = 0; i <
indices.length; i++) {\n *   const loc = inBuffer.indexToLoc(indices[i]);\n *   const offset = i * condShape.length;\n *
out.values.set(loc, offset);\n * }\n *\n * return out.toTensor() as Tensor2D;\n *\n * }\n *"/**\n * @license\n *
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=====
*\n\nimport {whereImpl} from './backends/where_impl';\nimport {Tensor, Tensor2D} from './tensor';\nimport
{convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\n\n\n/**\n * Returns the
coordinates of true elements of condition.\n *\n * The coordinates are returned in a 2-D tensor where the first
dimension (rows)\n * represents the number of true elements, and the second dimension (columns)\n * represents
the coordinates of the true elements. Keep in mind, the shape of\n * the output tensor can vary depending on how many
true values there are in\n * input. Indices are output in row-major order. The resulting tensor has the\n * shape
[numTrueElems, condition.rank] .\n *\n * This is analogous to calling the python `tf.where(cond)` without an x or
y.\n *\n * ```js\n * const cond = tf.tensor1d([false, false, true], 'bool');\n * const result = await
tf.whereAsync(cond);\n * result.print();\n * ```\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n *\n\nexport function whereAsync_(condition: Tensor|TensorLike): Promise<Tensor2D> {\n * const $condition =\n *
convertToTensor(condition, 'condition', 'whereAsync', 'bool');\n * const vals = await $condition.data();\n * const res =
whereImpl($condition.shape, vals);\n * if (condition !== $condition) {\n *   $condition.dispose();\n * }\n *\n *
return res;\n * }\n *\n\nexport const whereAsync = whereAsync_;\n *"/**\n * @license\n * Copyright 2018 Google LLC. All
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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\n

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```

*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport * as util from './util';\n\nimport {gather} from './gather';\nimport {reshape} from
'/reshape';\nimport {squeeze} from './squeeze';\nimport {whereAsync} from './where_async';\n\n/**\n * Apply
boolean mask to tensor.\n * \n * `js`\n * const tensor = tf.tensor2d([1, 2, 3, 4, 5, 6], [3, 2]);\n * const mask =
tf.tensor1d([1, 0, 1], 'bool');\n * const result = await tf.booleanMaskAsync(tensor, mask);\n * result.print();\n * ``\n
*\n * @param tensor N-D tensor.\n * @param mask K-D boolean tensor, K <= N and K must be known statically.\n
*\n * @param axis A 0-D int Tensor representing the axis in tensor to mask from.\n * By default, axis is 0 which will
mask from the first dimension.\n * Otherwise K + axis <= N.\n * \n * @doc {heading: 'Tensors', subheading:
'Slicing and Joining'}\n *\n\nasync function booleanMaskAsync_(\n  tensor: Tensor|TensorLike, mask:
Tensor|TensorLike,\n  axis?: number): Promise<Tensor> {\n  const $tensor = convertToTensor(tensor, 'tensor',
'boolMask');\n  const $mask = convertToTensor(mask, 'mask', 'boolMask', 'bool');\n  \n  const axisFrom = axis === null
? 0 : axis;\n  const maskDim = $mask.rank;\n  const tensorShape = $tensor.shape;\n  \n  util.assert(maskDim > 0, ()
=> 'mask cannot be scalar');\n  util.assertShapesMatch(\n    tensorShape.slice(axisFrom, axisFrom + maskDim),
$mask.shape,\n    `mask's shape must match the first K dimensions of tensor's shape,`);\n  \n  let leadingSize = 1;\n
for (let i = axisFrom; i < axisFrom + maskDim; i++) {\n    leadingSize *= tensorShape[i];\n  }\n  const
targetTensorShape =\n    tensorShape.slice(0, axisFrom)\n    .concat([leadingSize], tensorShape.slice(axisFrom
+ maskDim));\n  const reshapedTensor = reshape($tensor, targetTensorShape);\n  const reshapedMask =
reshape($mask, [-1]);\n  const positivePositions = await whereAsync(reshapedMask);\n  const indices =
squeeze(positivePositions, [1]);\n  \n  const res = gather(reshapedTensor, indices, axisFrom);\n  \n  // Ensure no
memory leak.\n  if (tensor !== $tensor) {\n    $tensor.dispose();\n  }\n  if (mask !== $mask) {\n    $mask.dispose();\n
}\n  indices.dispose();\n  reshapedTensor.dispose();\n  reshapedMask.dispose();\n  positivePositions.dispose();\n
return res;\n}\n\nexport const booleanMaskAsync = booleanMaskAsync_;\n", "/**\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}
from './types';\nimport {parseAxisParam} from './util';\n\nimport {abs} from './abs';\nimport * as axis_util from
'/axis_util';\nimport {max} from './max';\nimport {min} from './min';\nimport {op} from './operation';\nimport
{pow} from './pow';\nimport {reshape} from './reshape';\nimport {scalar} from './scalar';\nimport {sqrt} from
'/sqrt';\nimport {square} from './square';\nimport {sum} from './sum';\n\n/**\n * Computes the norm of scalar,
vectors, and matrices.\n * This function can compute several different vector norms (the 1-norm, the\n * Euclidean
or 2-norm, the inf-norm, and in general the p-norm for p > 0)\n * and matrix norms (Frobenius, 1-norm, and inf-
norm).\n * \n * `js`\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * \n * x.norm().print(); // or tf.norm(x)\n * ``\n
*\n * @param x The input array.\n * @param ord Optional. Order of the norm. Supported norm types are\n * following:\n
*\n * | ord      | norm for matrices      | norm for vectors\n * |-----|-----|-----|\n
*\n * |'euclidean'|Frobenius norm      |2-norm\n * |'fro'    |Frobenius norm\t      |\n * |Infinity
|max(sum(abs(x), axis=1)) |max(abs(x))\n * |-Infinity |min(sum(abs(x), axis=1)) |min(abs(x))\n * |1
|max(sum(abs(x), axis=0)) |sum(abs(x))\n * |2      |      |sum(abs(x)^2)^1/2*\n * \n * @param axis
Optional. If axis is null (the default), the input is\n * considered a vector and a single vector norm is computed over
the entire\n * set of values in the Tensor, i.e. norm(x, ord) is equivalent\n * to norm(x.reshape([-1]), ord). If axis is a
integer, the input\n * is considered a batch of vectors, and axis determines the axis in x\n * over which to compute
vector norms. If axis is a 2-tuple of integer it is\n * considered a batch of matrices and axis determines the axes in
NDArray\n * over which to compute a matrix norm.\n * @param keepDims Optional. If true, the norm have the
same dimensionality\n * as the input.\n * \n * @doc {heading: 'Operations', subheading: 'Matrices'}\n *\n\nfunction

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norm_(\n  x: Tensor|TensorLike, ord: number|'euclidean'|'fro' = 'euclidean',\n  axis: number|number[] = null,
keepDims = false): Tensor {\n  x = convertToTensor(x, 'x', 'norm');\n  const norm = normImpl(x, ord, axis);\n  let
keepDimsShape = norm.shape;\n  if (keepDims) {\n    const axes = parseAxisParam(axis, x.shape);\n    keepDimsShape = axis_util.expandShapeToKeepDim(norm.shape, axes);\n  }\n  return reshape(norm,
keepDimsShape);\n}\n\nfunction normImpl(\n  x: Tensor, p: number|string, axis: number|number[] = null): Tensor
{\n  if (x.rank === 0) {\n    return abs(x);\n  }\n  // consider vector when no axis is specified\n  if (x.rank !== 1 &&
axis === null) {\n    return normImpl(reshape(x, [-1]), p, axis);\n  }\n  // vector\n  if (x.rank === 1 || typeof axis
=== 'number' ||\n    Array.isArray(axis) && axis.length === 1) {\n    if (p === 1) {\n      return sum(abs(x), axis);\n    }
\n    if (p === Infinity) {\n      return max(abs(x), axis);\n    }\n    if (p === -Infinity) {\n      return min(abs(x),
axis);\n    }\n    if (p === 'euclidean' || p === 2) {\n      // norm(x, 2) = sum(abs(xi) ^ 2) ^ 1/2\n      return
sqrt(sum(pow(abs(x), scalar(2, 'int32')), axis));\n    }\n    throw new Error(`Error in norm: invalid ord value:
${p}`);\n  }\n  // matrix (assumption axis[0] < axis[1])\n  if (Array.isArray(axis) && axis.length === 2) {\n    if (p
=== 1) {\n      return max(sum(abs(x), axis[0]), axis[1] - 1);\n    }\n    if (p === Infinity) {\n      return
max(sum(abs(x), axis[1]), axis[0]);\n    }\n    if (p === -Infinity) {\n      return min(sum(abs(x), axis[1]), axis[0]);\n
}\n    if (p === 'fro' || p === 'euclidean') {\n      // norm(x) = sqrt(sum(pow(x, 2)))\n      return sqrt(sum(square(x),
axis));\n    }\n    throw new Error(`Error in norm: invalid ord value: ${p}`);\n  }\n  throw new Error(`Error in
norm: invalid axis: ${axis}`);\n}\n\nexport const norm = op({norm_});\n\n", "/*\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\n\nimport {Scalar, Tensor} from './tensor';\nimport {assertTypesMatch} from './tensor_util';\nimport
{convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from
'./util';\n\nimport {add} from './add';\nimport {div} from './div';\nimport {mul} from './mul';\nimport {op} from
'./operation';\nimport {pow} from './pow';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\n**\n *
Compute the moving average of a variable.\n * Without zeroDebias, the moving average operation is defined
by:\n *  $v += \delta$ \n * where\n *  $\delta = (1 - \text{decay}) * (x - v)$ \n * With zeroDebias (default), the  $\delta$  term
is scaled to debias the\n * effect of the (assumed) zero-initialization of  $v$ .\n *  $\delta /= (1 - \text{decay} ^ \text{step})$ \n *
For more details on the zero-debiasing algorithm, see:\n * https://arxiv.org/abs/1412.6980\n * Note that this
function is completely stateless and does not keep track of\n * step count. The step count needs to be maintained by
the caller and passed\n * in as `step`.\n * @param v The current moving average value.\n * @param x New
input value, must have the same shape and dtype as  $v$ .\n * @param decay The decay factor. Typical values are
0.95 and 0.99.\n * @param step Step count.\n * @param zeroDebias: Whether zeroDebias is to be performed
(default: `true`).\n * @returns The new moving average value.\n * @doc {heading: 'Operations', subheading:
'Moving Average'}\n\nfunction movingAverage_<T extends Tensor>(\n  v: T|TensorLike, x: T|TensorLike,
decay: number|Scalar,\n  step?: number|Scalar, zeroDebias = true): T {\n  const $v = convertToTensor(v, 'v',
'movingAverage');\n  const $x = convertToTensor(x, 'x', 'movingAverage');\n  const $decay =
convertToTensor(decay, 'decay', 'movingAverage');\n  assertTypesMatch($v, $x);\n  util.assert(\n
util.arraysEqual($v.shape, $x.shape), () => 'Shape mismatch in v and x');\n  const one = scalar(1);\n  const
oneMinusDecay = sub(one, $decay);\n  let update = mul(sub($x, $v), oneMinusDecay);\n  if (zeroDebias) {\n
util.assert(\n    step != null, () => 'When using zeroDebias: true, step is required.);\n  const $step =
convertToTensor(step, 'step', 'movingAverage');\n  update = div(update, sub(one, pow($decay, $step)));\n }\n
return add($v, update);\n}\n\nexport const movingAverage = op({movingAverage_});\n\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the

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*\n\nimport {ENGINE} from '../engine';\nimport {ScatterNd, ScatterNdAttrs, ScatterNdInputs} from
../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport
{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank,
ShapeMap, TensorLike} from '../types';\nimport {op} from './operation';\nimport * as scatter_nd_util from
../scatter_nd_util';\n\n/**\n * Creates a new tensor by applying sparse updates to individual\n * values or slices
within a zero tensor of the given shape tensor according to\n * indices. This operator is the inverse of the
`tf.gatherND` operator which\n * extracts values or slices from a given tensor.\n *\n * const indices =
tf.tensor2d([4, 3, 1, 7], [4, 1], 'int32');\n * const updates = tf.tensor1d([9, 10, 11, 12]);\n * const shape = [8];\n *
tf.scatterND(indices, updates, shape).print() // [0, 11, 0, 10, 9, 0, 0, 12]\n *\n * @param indices The tensor
contains the indices into the output tensor.\n * @param updates The tensor contains the value for the indices.\n *
@param shape: The shape of the output tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Slicing and
Joining'}\n *\n function scatterND<R extends Rank>(\n   indices: Tensor|TensorLike, updates:
Tensor|TensorLike,\n   shape: ShapeMap[R]): Tensor<R> {\n   const $indices = convertToTensor(indices, 'indices',
'scatterND', 'int32');\n   const $updates = convertToTensor(updates, 'updates', 'scatterND');\n   scatter_nd_util.validateInput($updates, $indices, shape);\n   const inputs: ScatterNdInputs = {indices: $indices, updates: $updates};\n   const attrs: ScatterNdAttrs = {shape};\n   // tslint:disable-next-line: no-unnecessary-type-assertion\n   return ENGINE.runKernel(\n     ScatterNd, inputs as {} as NamedTensorMap,\n     attrs as {}
as NamedAttrMap) as Tensor<R>;\n }\n\nexport const scatterND = op({scatterND_});\n\n", /**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *\n
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*\n\nimport {Tensor} from '../tensor';\n\n/**\n * Validate sparseToDense inputs.\n *\n * @param sparseIndices A 0-D, 1-D, or 2-D Tensor of type int32.\n * sparseIndices[i] contains the complete index where sparseValues[i] will
be\n * placed.\n * @param sparseValues A 0-D or 1-D Tensor. Values\n * corresponding to each row of
sparseIndices, or a scalar value to be used for\n * all sparse indices.\n * @param outputShape number[]. Shape of
the dense output tensor.\n * @param validateIndices boolean. indice validation is not supported, error\n * will be
thrown if it is set.\n *\n function validateInput(\n   sparseIndices: Tensor, sparseValues: Tensor,\n   outputShape: number[],\n   defaultValues: Tensor) {\n   if (sparseIndices.dtype !== 'int32') {\n     throw new Error(\n       'tf.sparseToDense() expects the indices to be int32 type,' +\n       ` but the dtype was ${sparseIndices.dtype}.`);\n   }\n   if (sparseIndices.rank > 2) {\n     throw new Error(\n       'sparseIndices should be a scalar, vector, or matrix,' +\n       ` but got shape ${sparseIndices.shape}.`);\n   }\n   const numElems = sparseIndices.rank > 0 ?
sparseIndices.shape[0] : 1;\n   const numDims = sparseIndices.rank > 1 ? sparseIndices.shape[1] : 1;\n   if
(outputShape.length !== numDims) {\n     throw new Error(\n       'outputShape has incorrect number of elements:,'\n       +\n       ` ${outputShape.length}, should be: ${numDims}.`);\n   }\n   const numValues = sparseValues.size;\n   if
(! (sparseValues.rank === 0 ||\n     sparseValues.rank === 1 && numValues === numElems)) {\n     throw new
Error(\n       'sparseValues has incorrect shape ' +\n       `${sparseValues.shape}, should be [] or
[${numElems}]`);\n   }\n   if (sparseValues.dtype !== defaultValues.dtype) {\n     throw new
Error('sparseValues.dtype must match defaultValues.dtype');\n   }\n }\n\n", /**\n * @license\n *
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```
=====\n*\n\nimport {ENGINE} from './engine';\nimport {SparseToDense, SparseToDenseAttrs, SparseToDenseInputs}  
from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport * as sparse_to_dense from  
 './ops/sparse_to_dense_util';\nimport {Scalar, Tensor} from './tensor';\nimport {NamedTensorMap} from  
 './tensor_types';\nimport {convertToTensor} from './tensor_util_env';\nimport {Rank, ScalarLike, ShapeMap,  
TensorLike} from './types';\n\nimport {op} from './operation';\n\n/**\n * Converts a sparse representation into a  
dense tensor.\n *\n * Builds an array dense with shape outputShape such that:\n *\n * // If sparseIndices is scalar\n * dense[i] = (i == sparseIndices ? sparseValues : defaultValue)\n *\n * // If sparseIndices is a vector, then for each i\n * dense[sparseIndices[i]] = sparseValues[i]\n *\n * // If sparseIndices is an n by d matrix, then for each i in [0, n)\n * dense[sparseIndices[i][0], ..., sparseIndices[i][d-1]] = sparseValues[i]\n *\n * All other values in dense are set to  
defaultValue. If sparseValues is a\n * scalar, all sparse indices are set to this single value.\n *\n * If indices are  
repeated the final value is summed over all values for those\n * indices.\n *\n *`js\n * const indices =  
tf.tensor1d([4, 5, 6, 1, 2, 3], 'int32');\n * const values = tf.tensor1d([10, 11, 12, 13, 14, 15], 'float32');\n * const shape  
= [8];\n * tf.sparseToDense(indices, values, shape).print();\n *\n * @param sparseIndices A 0-D, 1-D, or 2-D  
Tensor of type int32.\n * sparseIndices[i] contains the complete index where sparseValues[i] will be\n * placed.\n *\n * @param sparseValues A 0-D or 1-D Tensor. Values\n * corresponding to each row of sparseIndices, or a scalar  
value to be used for\n * all sparse indices.\n *\n * @param outputShape Shape of the dense output tensor. the type is  
inferred.\n *\n * @param defaultValue Scalar. Value to set for indices not specified in\n * sparseIndices. Defaults to  
zero.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction sparseToDense<R> extends  
Rank>(\n  sparseIndices: Tensor|TensorLike, sparseValues: Tensor|TensorLike,\n  outputShape: ShapeMap[R],\n  defaultValue: Scalar|ScalarLike = 0): Tensor<R> {\n  const $sparseIndices =\n    convertToTensor(sparseIndices,  
'sparseIndices', 'sparseToDense', 'int32');\n  const $sparseValues =\n    convertToTensor(sparseValues,  
'sparseValues', 'sparseToDense');\n  const $defaultValue = convertToTensor(\n    defaultValue, 'defaultValue',  
'sparseToDense', $sparseValues.dtype);\n  sparse_to_dense.validateInput(\n    $sparseIndices, $sparseValues,  
outputShape, $defaultValue);\n  const inputs: SparseToDenseInputs = {\n    sparseIndices: $sparseIndices,\n    sparseValues: $sparseValues,\n    defaultValue: $defaultValue\n  };\n  const attrs: SparseToDenseAttrs =  
{outputShape};\n  return ENGINE.runKernel(\n    SparseToDense, inputs as {} as NamedTensorMap,\n    attrs  
as {} as NamedAttrMap);\n}\n\nexport const sparseToDense = op({sparseToDense_});\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
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=====\n*\n\nimport {ENGINE} from './engine';\nimport {GatherNd, GatherNdInputs} from './kernel_names';\nimport  
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor} from  
 './tensor_util_env';\nimport {TensorLike} from './types';\nimport {op} from './operation';\n\n/**\n * Gather slices  
from input tensor into a Tensor with shape specified by\n *\n *`indices`\n *\n *`indices` is a K-dimensional integer  
tensor, best thought of as a\n * (K-1)-dimensional tensor of indices into input, where each element defines a\n * slice  
of input:\n * output[\\(i_0, ..., i_{K-2}\\)] = input[indices[\\(i_0, ..., i_{K-2}\\)]]\n *\n * Whereas in `tf.gather`,  
`indices` defines slices into the first dimension of\n * input, in `tf.gatherND`, `indices` defines slices into the first N  
dimensions\n * of input, where N = indices.shape[-1].\n *\n * The last dimension of indices can be at most the rank
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of input:\n * indices.shape[-1] <= input.rank\n * \n * The last dimension of `indices` corresponds to elements\n * (if indices.shape[-1] == input.rank) or slices\n * (if indices.shape[-1] < input.rank) along dimension indices.shape[-1]
of\n * input.\n * The output tensor has shape\n * indices.shape[:-1] + input.shape[indices.shape[-1]:]\n * \n * Note that on CPU, if an out of bound index is found, an error is returned. On\n * GPU, if an out of bound index is found, a 0 is stored in the corresponding\n * output value.\n * \n * ``js\n * const indices = tf.tensor2d([0, 1, 1, 0], [2,2], 'int32');\n * const input = tf.tensor2d([9, 10, 11, 12], [2, 2]);\n * tf.gatherND(input, indices).print() // [10, 11]\n * ``\n * \n * @param x The tensor from which to gather values.\n * @param indices Index tensor, must be of type int32.\n * @doc {heading: 'Operations', subheading: 'Slicing and Joining'}\n */\nfunction gatherND_(x: Tensor|TensorLike, indices: Tensor|TensorLike): Tensor {\n  const $indices = convertToTensor(indices, 'indices', 'gatherND', 'int32');\n  const $x = convertToTensor(x, 'x', 'gatherND');\n  const inputs: GatherNdInputs = {params: $x, indices: $indices};\n  return ENGINE.runKernel(GatherNd, inputs as {} as NamedTensorMap);\n}\n\nexport const gatherND = op({gatherND_});\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *

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=====\n\n *\n *\nimport {Tensor} from './tensor';\nimport * as util from './util';\n\n/**\n * Normalize noise shape based on provided tensor and noise shape.\n * \n * @param x Tensor.\n * @param noiseShape The shape for the randomly generated keep/drop flags, as\n * an array of numbers. Optional.\n * @returns Normalized noise shape.\n *\nexport function getNoiseShape(x: Tensor, noiseShape?: number[]): number[] {\n  if (noiseShape == null) {\n    return x.shape.slice();\n  }\n  if (util.arraysEqual(x.shape, noiseShape)) {\n    return noiseShape;\n  }\n  if (x.shape.length === noiseShape.length) {\n    const newDimension: number[] = [];\n    for (let i = 0; i < x.shape.length; i++) {\n      if (noiseShape[i] == null && x.shape[i] != null) {\n        newDimension.push(x.shape[i]);\n      } else {\n        newDimension.push(noiseShape[i]);\n      }\n    }\n    return newDimension;\n  }\n  return noiseShape;\n}\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *

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=====\n\n *\n *\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\nimport {add} from './add';\nimport {div} from './div';\nimport {getNoiseShape} from './dropout_util';\nimport {floor} from './floor';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {randomUniform} from './random_uniform';\n\n/**\n * Computes dropout.\n * \n * ``js\n * const x = tf.tensor1d([1, 2, 2, 1]);\n * const rate = 0.75;\n * const output = tf.dropout(x, rate);\n * output.print();\n * ``\n * \n * @param x A floating point Tensor or TensorLike.\n * @param rate A float in the range [0, 1). The probability that each element\n * of x is discarded.\n * @param noiseShape An array of numbers of type int32, representing the\n * shape for randomly generated keep/drop flags. If the noiseShape has null\n * value, it will be automatically replaced with the x's relative dimension\n * size. Optional.\n * @param seed Used to create random seeds. Optional.\n * @returns A Tensor of the same shape of x.\n * \n * @doc {heading: 'Operations', subheading: 'Dropout'}\n */\nfunction dropout_(\n  x: Tensor|TensorLike, rate: number, noiseShape?: number[],\n  seed?: number|string): Tensor {\n  const $x = convertToTensor(x, 'x', 'dropout');\n  util.assert(\n    $x.dtype === 'float32',\n    () => `x has to be a floating point tensor since it's going to be ` +\n    `scaled, but got a

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$${x.dtype} tensor instead.);\n util.assert(\n    rate >= 0 && rate < 1,\n    () => `rate must be a float in the range\n    [0, 1), but got ${rate}.`);\n\n if (rate === 0) {\n    return x instanceof Tensor ? $x.clone() : $x;\n }\n\n const\n $noiseShape = getNoiseShape($x, noiseShape);\n const keepProb = 1 - rate;\n const multiplier = div(\n floor(add(randomUniform($noiseShape, 0, 1, 'float32', seed), keepProb)),\n keepProb);\n\n return mul($x,\n multiplier);\n}\n\nexport const dropout = op({dropout_});\n", "/**\n * @license\n * Copyright 2019 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *\n http://www.apache.org/licenses/LICENSE-2.0\n * \n *\n Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor1D} from './tensor';\nimport {tensor1d} from './tensor1d';\n\nexport function\n enclosingPowerOfTwo(value: number) {\n // Return 2**N for integer N such that 2**N >= value.\n return\n Math.floor(Math.pow(2, Math.ceil(Math.log(value) / Math.log(2.0))));\n }\n\nexport function cosineWindow(\n windowLength: number, a: number, b: number): Tensor1D {\n const even = 1 - windowLength % 2;\n const\n newValues = new Float32Array(windowLength);\n for (let i = 0; i < windowLength; ++i) {\n const cosArg = (2.0\n * Math.PI * i) / (windowLength + even - 1);\n newValues[i] = a - b * Math.cos(cosArg);\n }\n return\n tensor1d(newValues, 'float32');\n}\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n * \n *\n http://www.apache.org/licenses/LICENSE-2.0\n * \n *\n Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {Tensor} from './tensor';\nimport {convertToTensor} from './tensor_util_env';\nimport {TensorLike}\n from './types';\nimport {assert, assertShapesMatch, getTypedArrayFromDType} from './util';\nimport {tensor}\n from './tensor';\n\n/**\n * Returns whether the targets are in the top K predictions.\n * ```\n * const predictions\n = tf.tensor2d([[20, 10, 40, 30], [30, 50, -20, 10]]);\n * const targets = tf.tensor1d([2, 0]);\n * const precision = await\n tf.inTopKAsync(predictions, targets);\n * precision.print();\n * ```\n * @param predictions 2-D or higher `tf.Tensor`\n with last dimension being\n * at least `k`.\n * @param targets 1-D or higher `tf.Tensor`.\n * @param k Optional\n Number of top elements to look at for computing precision,\n * default to 1.\n * @doc {heading: 'Operations',\n subheading: 'Evaluation'}\n *\n ^\nasync function inTopKAsync<T extends Tensor, U extends Tensor>(\n predictions: T|TensorLike, targets: U|TensorLike, k = 1): Promise<U> {\n const $predictions =\n convertToTensor(predictions, 'predictions', 'inTopK');\n const $targets = convertToTensor(targets, 'targets',\n 'inTopK');\n\n assert(\n $predictions.rank > 1,\n () => 'inTopK() expects the predictions to be of rank 2 or\n higher, '\n `but got ${$predictions.rank}`);\n assert(\n $predictions.rank - 1 === $targets.rank,\n () =>\n `predictions rank should be 1 larger than`\n ` +\n `targets rank, but got predictions rank`\n ` +\n `${$predictions.rank} and targets rank `${$targets.rank}`);\n assertShapesMatch(\n $predictions.shape.slice(0,\n $predictions.shape.length - 1),\n $targets.shape,\n `predictions's shape should be align with the targets' shape,\n ` +\n `except the last dimension.`);\n const lastDim = $predictions.shape[$predictions.shape.length - 1];\n\n assert(\n k > 0 && k <= lastDim,\n () => `k` passed to inTopK() must be > 0 && <= the predictions last`\n ` +\n `dimension (${lastDim}), but got ${k}`);\n\n const predictionsVals = await $predictions.data();\n const\n targetsVals = await $targets.data();\n\n // Reshape predictionsVals into a 2d tensor [batch, lastDim]\n // and look up\n topK along lastDim.\n const [batch, size] = [predictionsVals.length / lastDim, lastDim];\n const precision =\n getTypedArrayFromDType('bool', batch);\n\n for (let b = 0; b < batch; b++) {\n const offset = b * size;\n const\n vals = predictionsVals.subarray(offset, offset + size);\n const valAndInd: Array<{value: number, index: number}>

```

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= [];\n  for (let i = 0; i < vals.length; i++) {\n    valAndInd.push({ value: vals[i], index: i });\n  }\n  valAndInd.sort((a, b) => b.value - a.value);\n  precision[b] = 0;\n  for (let i = 0; i < k; i++) {\n    if\n    (valAndInd[i].index === targetsVals[b]) {\n      precision[b] = 1;\n      break;\n    }\n  }\n  if (predictions\n  !== $predictions) {\n    $predictions.dispose();\n  }\n  if (targets !== $targets) {\n    $targets.dispose();\n  }\n  //\n  Output precision has the same shape as targets.\n  return tensor(precision, $targets.shape, 'bool') as U;\n}\n\nexport\nconst inTopKAsync = inTopKAsync_;\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n  Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n  except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n *\n  =====\n\n *\nimport {ENGINE} from './engine';\nimport {Conv2DBackpropFilter, Conv2DBackpropFilterAttrs,\nConv2DBackpropFilterInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport * as util from\n './util';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from\n './reshape';\n\n/**\n * Computes the derivative of the filter of a 2D convolution.\n *\n * @param x The input tensor,\n  of rank 4 or rank 3 of shape\n * [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param dy The dy image, of rank 4 or rank 3, of shape\n * [batch, height, width, outDepth]. If rank 3, batch of 1 is\n  assumed.\n * @param filterShape The shape of the filter, length 4,\n * [filterHeight, filterWidth, inDepth,\n  outDepth].\n * @param strides The strides of the convolution: [strideHeight,\n * strideWidth].\n * @param pad A\n  string from: 'same', 'valid'. The type of padding algorithm\n * used in the forward prop of the op.\n * @param\n  dataFormat: An optional string from: 'NHWC', 'NCHW'. Defaults to\n * 'NHWC'. Specify the data format\n  of the input and output data. With the\n * default format 'NHWC', the data is stored in the order of: [batch,\n * height, width, channels].\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *  

provided, it will default to truncate.\n\nfunction conv2DBackpropFilter_<T extends Tensor3D|Tensor4D>(\n  x:\n  T, dy: T, filterShape: [number, number, number, number],\n  strides: [number, number][number, number],\n  pad:\n  'valid'|'same'|number|conv_util.ExplicitPadding,\n  dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n  dimRoundingMode?: 'floor'|'round'|'ceil'): Tensor4D {\n  let x4D = x as Tensor4D;\n  if (x.rank === 3) {\n    x4D =\n    reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n  }\n  let dy4D = dy as Tensor4D;\n  if (dy4D.rank === 3) {\n    dy4D =\n    reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n  }\n  util.assert(\n    x4D.rank === 4,\n    () =>\n    `Error in conv2dDerFilter: input must be rank 4, but got shape ` +\n    `${x4D.shape}`);\n  util.assert(\n    dy4D.rank === 4,\n    () =>\n    `Error in conv2dDerFilter: dy must be rank 4, but got shape ` +\n    `${dy4D.shape}`);\n  util.assert(\n    filterShape.length === 4,\n    () =>\n    `Error in conv2dDerFilter: filterShape\n    must be length 4, but got ` +\n    `${filterShape}`);\n  const inDepth = dataFormat === 'NHWC' ? x4D.shape[3]\n  : x4D.shape[1];\n  const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] : dy4D.shape[1];\n  util.assert(\n    inDepth === filterShape[2],\n    () =>\n    `Error in conv2dDerFilter: depth of input ${inDepth}) must ` +\n    `match input depth in filter (${filterShape[2]});\n  util.assert(\n    outDepth === filterShape[3],\n    () =>\n    `Error\n    in conv2dDerFilter: depth of dy (${outDepth}) must ` +\n    `match output depth for filter\n    (${filterShape[3]});\n  if (dimRoundingMode != null) {\n    util.assert(\n      util.isInt(pad as number),\n      ()\n      =>\n      `Error in conv2dDerFilter: pad must be an integer when using, ` +\n      `dimRoundingMode\n      ${dimRoundingMode} but got pad ${pad}`);\n  }\n  const inputs: Conv2DBackpropFilterInputs = {x: x4D, dy:\n  dy4D};\n  const attrs: Conv2DBackpropFilterAttrs = {\n    strides, pad, dataFormat, dimRoundingMode,\n    filterShape};\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  return ENGINE.runKernel(\n    Conv2DBackpropFilter, inputs as {} as NamedTensorMap,\n    attrs as {} as NamedAttrMap) as\n    Tensor4D;\n}\n\nexport const conv2DBackpropFilter = op({conv2DBackpropFilter_});\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the

```

"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Tensor} from './tensor';\nimport * as broadcast_util from './broadcast_util';\nimport {elu} from './elu';\nimport {Activation} from './fused_types';\nimport {leakyRelu} from './leaky_relu';\nimport {mul} from './mul';\nimport {prelu} from './prelu';\nimport {relu} from './relu';\nimport {relu6} from './relu6';\nimport {reshape} from './reshape';\nimport {step} from './step';\nimport {sum} from './sum';\n\n// Returns gradient for fused activation.\nexport function getFusedDyActivation(\n  dy: Tensor, y: Tensor, activation: Activation): Tensor {\n  (activation == null || activation === 'linear') {\n    return dy;\n  }\n  if (activation === 'relu') {\n    return mul(dy, step(y));\n  }\n  throw new Error(`Cannot compute gradient for fused activation ${activation}.`);\n}\n\n// Returns gradient for fused bias.\nexport function getFusedBiasGradient(\n  bias: Tensor, dyActivation: Tensor): Tensor {\n  let res = dyActivation;\n  const reduceAxes =\n    broadcast_util.getReductionAxes(bias.shape, dyActivation.shape);\n  if (reduceAxes.length > 0) {\n    res = sum(res, reduceAxes);\n  }\n  return reshape(res, bias.shape);\n}\n\nexport function applyActivation(\n  x: Tensor, activation: Activation, preluActivationWeights?: Tensor,\n  leakyreluAlpha?: number): Tensor {\n  if (activation === 'linear') {\n    return x;\n  } else if (activation === 'relu') {\n    return relu(x);\n  } else if (activation === 'elu') {\n    return elu(x);\n  } else if (activation === 'relu6') {\n    return relu6(x);\n  } else if (activation === 'prelu') {\n    return prelu(x, preluActivationWeights);\n  } else if (activation === 'leakyrelu') {\n    return leakyRelu(x, leakyreluAlpha);\n  }\n  throw new Error(`Unknown fused activation ${activation}.`);\n}\n\n// Whether we should call fused ops.\nexport const shouldFuse = (gradientDepth: number, activation: Activation) => {\n  const gradientMode = gradientDepth > 0;\n  return !gradientMode || activation === 'linear';\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {ENGINE} from './../engine';\nimport {customGrad} from './../gradients';\nimport {FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs} from './../kernel_names';\nimport {NamedAttrMap} from './../kernel_registry';\nimport {Tensor, Tensor3D, Tensor4D} from './../tensor';\nimport {GradSaveFunc, NamedTensorMap} from './../tensor_types';\nimport {makeTypesMatch} from './../tensor_util';\nimport {convertToTensor} from './../tensor_util_env';\nimport {TensorLike} from './../types';\nimport * as util from './../util';\nimport {add} from './add';\nimport * as broadcast_util from './broadcast_util';\nimport {conv2d as unfusedConv2d} from './conv2d';\nimport {conv2DBackpropFilter} from './conv2d_backprop_filter';\nimport {conv2DBackpropInput} from './conv2d_backprop_input';\nimport * as conv_util from './conv_util';\nimport {Activation} from './fused_types';\nimport {applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from './fused_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes a 2D convolution over the input x, optionally fused with adding a\n * bias and applying an activation.\n *\n * const inputDepth = 2;\n * const inShape = [2, 2, 2, inputDepth];\n * const outputDepth = 2;\n * const fSize = 1;\n * const pad = 0;\n * const strides = 1;\n * const x = tf.tensor4d([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,\n * 16], inShape);\n * const w = tf.tensor4d([-1, 1, -2, 0.5], [fSize, fSize, inputDepth,\n * outputDepth]);\n * const dataFormat = 'NHWC';\n * const dilations = [1, 1];\n * const bias = tf.scalar(5);\n * const activation = 'relu';\n *\n * @param obj An object with the following properties:\n * @param x The input tensor, of rank 4 or rank 3, of shape\n * [batch, height, width, inChannels]. If rank 3, batch
```

of 1 is assumed.

`@param filter` The filter, rank 4, of shape `[filterHeight, filterWidth, inDepth, outDepth]`.

`@param strides` The strides of the convolution: `[strideHeight, strideWidth]`.

`@param pad` The type of padding algorithm. `'same'` and stride 1: output will be of same size as input, regardless of filter size. `'valid'` output will be smaller than input if filter is larger than 1x1.

For more info, see this guide: https://www.tensorflow.org/api_guides/python/nn#Convolution

`@param dataFormat` An optional string from: `'NHWC'`, `'NCHW'`. Defaults to `'NHWC'`. Specify the data format of the input and output data. With the default format `'NHWC'`, the data is stored in the order of: [batch, height, width, channels]. Only `'NHWC'` is currently supported.

`@param dilations` The dilation rates: `[dilationHeight, dilationWidth]` in which we sample input values across the height and width dimensions in atrous convolution. Defaults to `[1, 1]`. If `dilations` is a single number, then `dilationHeight == dilationWidth`. If it is greater than 1, then all values of `strides` must be 1.

`@param dimRoundingMode` A string from: `'ceil'`, `'round'`, `'floor'`. If none is provided, it will default to `truncate`.

`@param bias` Tensor to be added to the result.

`@param activation` Name of activation kernel (defaults to `'linear'`) to be applied after `biasAdd`.

`@param preluActivationWeights` Tensor of prelu weights to be applied as part of a `'prelu'` activation, typically the same shape as `x`.

`@param leakyreluAlpha` Optional. Alpha to be applied as part of a `'leakyrelu'` activation.

```

function fusedConv2d<T extends Tensor3D|Tensor4D>({
  x: TensorLike,
  filter: Tensor4D|TensorLike,
  strides: [number, number],
  number,
  pad: 'valid'|'same'|number|conv_util.ExplicitPadding,
  dataFormat?: 'NHWC'|'NCHW',
  dilations?: [number, number]|number,
  dimRoundingMode?: 'floor'|'round'|'ceil',
  bias?: Tensor|TensorLike,
  activation?: Activation,
  preluActivationWeights?: Tensor,
  leakyreluAlpha?: number
}): T {
  activation = activation || 'linear';
  if (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {
    let result = unfusedConv2d(
      x, filter, strides, pad, dataFormat, dilations, dimRoundingMode);
    if (bias != null) {
      result = add(result, bias);
    }
    return applyActivation(result, activation,
      preluActivationWeights, leakyreluAlpha) as T;
  }
  const $x = convertToTensor(x, 'x', 'conv2d');
  const $filter = convertToTensor(filter, 'filter', 'conv2d');
  let x4D = $x as Tensor4D;
  let reshapedTo4D = false;
  if ($x.rank === 3) {
    reshapedTo4D = true;
    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);
  }
  util.assert(x4D.rank === 4, () => `Error in fused conv2d: input must be rank 4, but got rank ` +
    `${x4D.rank}.`);
  util.assert($filter.rank === 4, () => `Error in fused conv2d: filter must be rank 4, but
  got rank ` +
    `${$filter.rank}.`);
  if (dimRoundingMode != null) {
    util.assert(util.isInt(pad as number),
      () => `Error in fused conv2d: pad must be an integer when using, ` +
    `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);
  }
  util.assert(x4D.shape[3] === $filter.shape[2],
    () => `Error in conv2d: depth of input (${x4D.shape[3]}) must match ` +
    `input depth for filter ${$filter.shape[2]}.`);
  util.assert(conv_util.eitherStridesOrDilationsAreOne(strides, dilations),
    () => `Error in conv2D: Either strides or dilations must be 1.` +
    `Got strides ${strides} and dilations ${dilations}`);
  util.assert(dataFormat === 'NHWC',
    () => `Error in conv2d: got dataFormat of ${dataFormat} but only NHWC is currently supported.`);
  const convInfo = conv_util.computeConv2DInfo(
    x4D.shape, $filter.shape, strides, dilations, pad, dimRoundingMode);
  let $bias: Tensor;
  if (bias != null) {
    $bias = convertToTensor(bias, 'bias', 'fused conv2d');
    [$bias] = makeTypesMatch($bias, $x);
  }
  broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);
  let $preluActivationWeights: Tensor;
  if (preluActivationWeights != null) {
    $preluActivationWeights = convertToTensor(
      preluActivationWeights, 'prelu weights', 'fused conv2d');
  }
  const grad = (dy: Tensor4D, saved: Tensor[]) => {
    const [$filter, x4D, y, $bias] = saved as [Tensor4D, Tensor4D, Tensor4D, Tensor];
    const dyActivation = getFusedDyActivation(dy, y, activation) as Tensor4D;
    util.assert(conv_util.tupleValuesAreOne(dilations),
      () => `Error in gradient of fused conv2D: ` +
    `dilation rates greater than 1 ` +
    `are not yet supported in gradients. Got dilations ${dilations}`);
    const xDer = conv2DBackpropInput(x4D.shape, dyActivation, $filter, strides, pad);
    const filterDer =

```

```

conv2DBackpropFilter(x4D, dyActivation, $filter.shape, strides, pad);\n  const der: Tensor[] = [xDer,
filterDer];\n\n  if ($bias != null) {\n    const biasDer = getFusedBiasGradient($bias, dyActivation);\n    der.push(biasDer);\n  }\n  return der;\n};\n\nconst inputs: FusedConv2DInputs = {\n  x: x4D,\n  filter: $filter,\n  bias: $bias,\n  preluActivationWeights: $preluActivationWeights\n};\n\nconst attrs: FusedConv2DAttrs = {\n  strides,\n  pad,\n  dataFormat,\n  dilations,\n  dimRoundingMode,\n  activation,\n  leakyreluAlpha\n};\n\n// Depending on the the params passed in we will have different number of\n// inputs and thus a a different number of elements in the gradient.\nif (bias == null) {\n  const customOp =\n  customGrad((x4D: Tensor4D, filter: Tensor4D, save: GradSaveFunc) => {\n    let res: Tensor4D|Tensor3D =\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n      ENGINE.runKernel(\n        FusedConv2D, inputs as {} as NamedTensorMap,\n        attrs as {} as NamedAttrMap);\n    save([filter, x4D, res]);\n    if (reshapedTo4D) {\n      // tslint:disable-next-line: no-unnecessary-type-assertion\n      res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n        Tensor3D;\n    }\n    return {value: res, gradFunc: grad};\n  });\n  return customOp(x4D, $filter) as T;\n} else {\n  const customOpWithBias = customGrad(\n    (x4D: Tensor4D, filter: Tensor4D, bias: Tensor, save: GradSaveFunc) => {\n      let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n        FusedConv2D, inputs as {} as NamedTensorMap,\n        attrs as {} as NamedAttrMap);\n      save([filter, x4D, res, bias]);\n      if (reshapedTo4D) {\n        // tslint:disable-next-line: no-unnecessary-type-assertion\n        res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n          Tensor3D;\n      }\n      return {value: res, gradFunc: grad};\n    });\n  return customOpWithBias(x4D, $filter, $bias) as T;\n}\n\nexport const conv2d =\n  op({fusedConv2d});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n*/\nimport {ENGINE} from './engine';\nimport {DepthwiseConv2dNativeBackpropFilter, DepthwiseConv2dNativeBackpropFilterAttrs, DepthwiseConv2dNativeBackpropFilterInputs} from './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\nfunction depthwiseConv2dNativeBackpropFilter_<T extends Tensor3D|Tensor4D>(\n  x: T, dy: T, filterShape: [number, number, number, number],\n  strides: [number, number]|number, pad: 'valid'|'same'|number,\n  dilations: [number, number]|number = [1, 1],\n  dimRoundingMode?: 'floor'|'round'|'ceil': Tensor4D {\n  let x4D = x as Tensor4D;\n  if (x.rank === 3) {\n    x4D = reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n  }\n  let dy4D = dy as Tensor4D;\n  if (dy4D.rank === 3) {\n    dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n  }\n\n  const inputs: DepthwiseConv2dNativeBackpropFilterInputs = {x: x4D, dy: dy4D};\n  const attrs: DepthwiseConv2dNativeBackpropFilterAttrs = {\n    strides, pad, dimRoundingMode, dilations, filterShape\n};\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  return ENGINE.runKernel(\n    DepthwiseConv2dNativeBackpropFilter,\n    inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap) as\n    Tensor4D;\n}\n\nexport const depthwiseConv2dNativeBackpropFilter =\n  op({depthwiseConv2dNativeBackpropFilter_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */

```



```

=====
*\nimport {ENGINE} from './engine';\nimport {DepthwiseConv2dNativeBackpropInput,
DepthwiseConv2dNativeBackpropInputAttrs, DepthwiseConv2dNativeBackpropInputInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor3D, Tensor4D} from
 './tensor';\nimport {NamedTensorMap} from './tensor_types';\n\nimport {op} from './operation';\nimport {reshape}
from './reshape';\n\nfunction depthwiseConv2dNativeBackpropInput_<T extends Tensor3D|Tensor4D>(\n  xShape:
[number, number, number, number], dy: T, filter: Tensor4D,\n  strides: [number, number]|number, pad:
'valid'|'same'|number,\n  dilations: [number, number]|number = [1, 1],\n  dimRoundingMode?: 'floor'|'round'|'ceil'):
T {\n  let dy4D = dy as Tensor4D;\n  let reshapedTo4D = false;\n  if (dy.rank === 3) {\n    reshapedTo4D = true;\n    dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n  }\n  \n  const inputs:
DepthwiseConv2dNativeBackpropInputInputs = {dy: dy4D, filter};\n  const attrs:
DepthwiseConv2dNativeBackpropInputAttrs =\n    {strides, pad, dimRoundingMode, dilations, inputShape:
xShape};\n  \n  const res =\n    // tslint:disable-next-line: no-unnecessary-type-assertion\n    ENGINE.runKernel(\n      DepthwiseConv2dNativeBackpropInput, inputs as {} as NamedTensorMap,\n      attrs as {} as
NamedAttrMap) as T;\n  \n  if (reshapedTo4D) {\n    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as
T;\n  }\n  \n  return res;\n}\n\nexport const depthwiseConv2dNativeBackpropInput =\n  op({depthwiseConv2dNativeBackpropInput_});\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
=====

```

```

=====
*\n\nimport {ENGINE} from './engine';\nimport {customGrad} from './gradients';\nimport
{FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs} from
 './kernel_names';\nimport {NamedAttrMap} from './kernel_registry';\nimport {Tensor, Tensor3D, Tensor4D}
from './tensor';\nimport {GradSaveFunc, NamedTensorMap} from './tensor_types';\nimport
{makeTypesMatch} from './tensor_util';\nimport {convertToTensor} from './tensor_util_env';\nimport
{TensorLike} from './types';\nimport * as util from './util';\n\nimport {add} from './add';\nimport * as
broadcast_util from './broadcast_util';\nimport * as conv_util from './conv_util';\nimport {depthwiseConv2d as
unfusedDepthwiseConv2d} from './depthwise_conv2d';\nimport {depthwiseConv2dNativeBackpropFilter} from
 './depthwise_conv2d_native_backprop_filter';\nimport {depthwiseConv2dNativeBackpropInput} from
 './depthwise_conv2d_native_backprop_input';\nimport {Activation} from './fused_types';\nimport
{applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from './fused_util';\nimport {op}
from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes depthwise 2D convolution, optionally
fused with adding a\n * bias and applying an activation.\n *\n * Given a 4D `input` array and a `filter` array of
shape\n * `[filterHeight, filterWidth, inChannels, channelMultiplier]` containing\n * `inChannels` convolutional
filters of depth 1, this op applies a\n * different filter to each input channel (expanding from 1 channel to\n *
`channelMultiplier` channels for each), then concatenates the results\n * together. The output has `inChannels` *
channelMultiplier` channels.\n *\n * See\n *
[https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d](\n *
https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d)\n * for more details.\n *\n * @param obj An
object with the following properties:\n * @param x The input tensor, of rank 4 or rank 3, of shape\n *
`[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter tensor, rank 4, of
shape\n * `[filterHeight, filterWidth, inChannels, channelMultiplier]`. \n * @param strides The strides of the
convolution: `[strideHeight,\n * strideWidth]`. If strides is a single number, then `strideHeight ==\n *
strideWidth`. \n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size
=====

```

as input, regardless of filter size. - `valid`: output will be smaller than input if filter is larger than 1x1. - For more info, see this guide: https://www.tensorflow.org/api_guides/python/nn#Convolution

`https://www.tensorflow.org/api_guides/python/nn#Convolution`

@param dilations The dilation rates: `[dilationHeight, dilationWidth]` in which we sample input values across the height and width dimensions in atrous convolution. Defaults to `[1, 1]`. If `rate` is a single number, then `dilationHeight == dilationWidth`. If it is greater than 1, then all values of `strides` must be 1.

@param dataType: An optional string from: `"NHWC"`, `"NCHW"`. Defaults to `"NHWC"`. Specify the data format of the input and output data. With the default format `"NHWC"`, the data is stored in the order of: [batch, height, width, channels]. Only `"NHWC"` is currently supported.

@param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is provided, it will default to truncate.

@param bias Tensor to be added to the result.

@param activation Name of activation kernel (defaults to `linear`).

@param preluActivationWeights Tensor of prelu weights to be applied as part of a `prelu` activation, typically the same shape as `x`.

@param leakyreluAlpha Optional. Alpha to be applied as part of a `leakyrelu` activation.

```

function fusedDepthwiseConv2d<T extends Tensor3D|Tensor4D>({
  x: T,
  filter: T,
  strides: [number, number],
  pad: number,
  dataType: 'NHWC'|'NCHW',
  dilations: [number, number],
  dimRoundingMode: 'floor'|'round'|'ceil',
  bias?: Tensor|TensorLike,
  activation?: Activation,
  preluActivationWeights?: Tensor,
  leakyreluAlpha?: number
}): T {
  if (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {
    let result = unfusedDepthwiseConv2d(x, filter, strides, pad, dataType, dilations, dimRoundingMode);
    if (bias != null) result = add(result, bias);
  }
  return applyActivation(result, activation, preluActivationWeights, leakyreluAlpha) as T;
}

const $x = convertToTensor(x, 'x', 'depthwiseConv2d');
const $filter = convertToTensor(filter, 'filter', 'depthwiseConv2d');
let x4D = $x as Tensor4D;
let reshapedTo4D = false;
if ($x.rank === 3) {
  reshapedTo4D = true;
  x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);
}
util.assert(x4D.rank === 4, () => `Error in fused depthwiseConv2d: input must be rank 4, but got ` + rank${x4D.rank}.`);
util.assert($filter.rank === 4, () => `Error in fused depthwiseConv2d: filter must be rank 4, ` + `but got rank ${$filter.rank}.`);
util.assert(x4D.shape[3] === $filter.shape[2], () => `Error in fused depthwiseConv2d: number of input channels ` + `(${x4D.shape[3]}) must match the inChannels dimension in ` + `filter ${$filter.shape[2]}.`);
if (dilations == null) {
  dilations = [1, 1];
}
util.assert(conv_util.eitherStridesOrDilationsAreOne(strides, dilations), () => `Error in fused depthwiseConv2d: Either strides or dilations must ` + `be 1. Got strides ${strides} and dilations ${dilations}`);
if (dimRoundingMode != null) {
  util.assert(util.isInt(pad as number), () => `Error in fused depthwiseConv2d: pad must be an integer when ` + `using dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);
}
const convInfo = conv_util.computeConv2DInfo(x4D.shape, $filter.shape, strides, dilations, pad, dimRoundingMode, true /* depthwise */);
let $bias: Tensor;
if (bias != null) {
  $bias = convertToTensor(bias, 'bias', 'fused conv2d');
  [$bias] = makeTypesMatch($bias, $x);
  broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);
}
let $preluActivationWeights: Tensor;
if (preluActivationWeights != null) {
  $preluActivationWeights = convertToTensor(preluActivationWeights, 'prelu weights', 'fused depthwiseConv2d');
}
const grad = (dy: Tensor4D, saved: Tensor[]) => {
  util.assert(conv_util.tupleValuesAreOne(dilations), () => `Error in gradient of fused depthwiseConv2d: dilation rates ` + `greater than 1 are not yet supported. Got dilations ` + `${dilations}`);
  const [$filter, x4D, y, bias] = saved;
  const dyActivation = getFusedDyActivation(dy, y, activation) as Tensor4D;
  const xDer = depthwiseConv2dNativeBackpropInput(x4D as Tensor4D).shape, dyActivation, $filter as Tensor4D, strides, pad, dilations, dimRoundingMode);
  const filterDer = depthwiseConv2dNativeBackpropFilter(x4D as Tensor4D, dyActivation, ($filter as Tensor4D).shape, strides, pad, dilations, dimRoundingMode);
  if (bias != null) {
    const biasDer = getFusedBiasGradient($bias, dyActivation);
    return [xDer, filterDer, biasDer];
  }
}

```



```

makeTypesMatch($a, $b);\n\n const innerShapeA =\n    transposeA ? $a.shape[$a.rank - 2] : $a.shape[$a.rank -
1];\n const innerShapeB =\n    transposeB ? $b.shape[$b.rank - 1] : $b.shape[$b.rank - 2];\n\n const
outerShapeA =\n    transposeA ? $a.shape[$a.rank - 1] : $a.shape[$a.rank - 2];\n const outerShapeB =\n    transposeB ? $b.shape[$b.rank - 2] : $b.shape[$b.rank - 1];\n\n const outerDimsA = $a.shape.slice(0, -2);\n const
outerDimsB = $b.shape.slice(0, -2);\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB
= util.sizeFromShape(outerDimsB);\n\n util.assert(\n    $a.rank >= 2 && $b.rank >= 2 && $a.rank ===
$b.rank,\n    () => `Error in fused matMul: inputs must have the same rank of at ` +\n        `least 2, got ranks
${$a.rank} and ${$b.rank}.`);\n\n util.assert(\n    util.arraysEqual(outerDimsA, outerDimsB),\n    () => `Error
in fused matMul: outer dimensions (${outerDimsA}) and (^ +\n        `${outerDimsB}) of Tensors with shapes
${$a.shape} and ` +\n        `${$b.shape} must match.`);\n\n util.assert(\n    innerShapeA === innerShapeB,\n    () => `Error in fused matMul: inner shapes (${innerShapeA}) and (^ +\n        `${innerShapeB}) of Tensors
with shapes ${$a.shape} and ` +\n        `${$b.shape} and transposeA=${transposeA}` +\n        ` and
transposeB=${transposeB} must match.`);\n\n const outShape = $a.shape.slice(0, -2).concat([outerShapeA,
outerShapeB]);\n\n const a3D: Tensor3D = transposeA ?\n    reshape($a, [batchDimA, innerShapeA,
outerShapeA]) :\n    reshape($a, [batchDimA, outerShapeA, innerShapeA]);\n const b3D: Tensor3D =
transposeB ?\n    reshape($b, [batchDimB, outerShapeB, innerShapeB]) :\n    reshape($b, [batchDimB,
innerShapeB, outerShapeB]);\n\n let $bias: Tensor;\n if (bias != null) {\n    $bias = convertToTensor(bias,
'bias', 'fused matMul');\n    [$bias] = makeTypesMatch($bias, $a);\n\n broadcast_util.assertAndGetBroadcastShape(outShape, $bias.shape);\n };\n\n let $preluActivationWeights:
Tensor;\n if (preluActivationWeights != null) {\n    $preluActivationWeights = convertToTensor(\n    preluActivationWeights, 'prelu weights', 'fused matMul');\n };\n\n const grad = (dy: Tensor3D, saved: Tensor[])
=> {\n    const [a3D, b3D, y, $bias] = saved;\n    // we reshape dy because the result of the forward is not\n    //
necessarily going to be a 3d tensor due to a reshape done at the end of\n    // the customOp.\n    const dyActivation
=\n        getFusedDyActivation(reshape(dy, y.shape), y, activation);\n    let aDer: Tensor;\n    let bDer:
Tensor;\n\n    if (!transposeA && !transposeB) {\n        aDer = unfusedMatMul(dyActivation, b3D, false, true);\n        bDer = unfusedMatMul(a3D, dyActivation, true, false);\n    } else if (!transposeA && transposeB) {\n        aDer = unfusedMatMul(dyActivation, b3D, false, false);\n        bDer = unfusedMatMul(dyActivation, a3D, true, false);\n    } else if (transposeA && !transposeB) {\n        aDer = unfusedMatMul(b3D, dyActivation, false, true);\n        bDer = unfusedMatMul(a3D, dyActivation, false, false);\n    } else {\n        aDer = unfusedMatMul(b3D, dyActivation, true, true);\n        bDer = unfusedMatMul(dyActivation, a3D, true, true);\n    };\n\n    if (bias != null) {\n        const biasDer = getFusedBiasGradient($bias, dyActivation);\n        return [aDer, bDer, biasDer];\n    } else {\n        return [aDer, bDer];\n    };\n };\n\n const inputs: _FusedMatMulInputs = {\n    a: a3D,\n    b: b3D,\n    bias: $bias,\n    preluActivationWeights: $preluActivationWeights\n };\n\n const attrs: _FusedMatMulAttrs =\n    {transposeA, transposeB, activation, leakyreluAlpha};\n\n // Depending on the the params passed in we will have
different number of\n // inputs and thus a a different number of elements in the gradient.\n if (bias === null) {\n    const customOp =\n        customGrad((a3D: Tensor3D, b3D: Tensor3D, save: GradSaveFunc) => {\n        const res =\n            // tslint:disable-next-line: no-unnecessary-type-assertion\n            ENGINE.runKernel(\n                _FusedMatMul, inputs as {} as NamedTensorMap,\n                attrs as {} as NamedAttrMap) as T;\n\n        save([a3D, b3D, res]);\n        return {value: reshape(res, outShape), gradFunc: grad};\n    });\n    return customOp(a3D, b3D) as T;\n } else {\n    const customOpWithBias = customGrad(\n        (a3D: Tensor3D, b3D:
Tensor3D, $bias: Tensor, save: GradSaveFunc) => {\n        const res =\n            // tslint:disable-next-line: no-unnecessary-type-assertion\n            ENGINE.runKernel(\n                _FusedMatMul, inputs as {} as
NamedTensorMap,\n                attrs as {} as NamedAttrMap) as T;\n\n        save([a3D, b3D, res, $bias]);\n        return {value: reshape(res, outShape), gradFunc: grad};\n    });\n    return customOpWithBias(a3D, b3D, $bias) as T;\n };\n };\n\n export const matMul = op({fusedMatMul_});\n\n /***\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

```

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {conv2d} from './fused/conv2d';\nimport {depthwiseConv2d} from './fused/depthwise_conv2d';\nimport {matMul} from './fused/mat_mul';\nimport {Activation} from './fused_types';\n\nexport {Activation, conv2d, depthwiseConv2d, matMul};\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor1D} from '../tensor';\nimport {op} from './operation';\nimport {cosineWindow} from './signal_ops_util';\n\n/**\n * Generate a hamming window.\n * See: https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n * tf.signal.hammingWindow(10).print();\n * @param The length of window\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n *\nfunction hammingWindow_(windowLength: number): Tensor1D {\n  return cosineWindow(windowLength, 0.54, 0.46);\n}\n\nexport const hammingWindow = op({hammingWindow_});\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor1D} from '../tensor';\nimport {op} from './operation';\nimport {cosineWindow} from './signal_ops_util';\n\n/**\n * Generate a Hann window.\n * See: https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n * tf.signal.hannWindow(10).print();\n * @param The length of window\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n *\nfunction hannWindow_(windowLength: number): Tensor1D {\n  return cosineWindow(windowLength, 0.5, 0.5);\n}\n\nexport const hannWindow = op({hannWindow_});\n\n/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {Tensor, Tensor1D} from '../tensor';\nimport {concat} from './concat';\nimport {fill} from './fill';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {slice} from './slice';\nimport {tensor2d} from './tensor2d';\n\n/**\n * Expands input into frames of frameLength.\n * Slides a window size with frameStep.\n * tf.signal.frame([1, 2, 3], 2, 1).print();\n * @param signal The input tensor to be expanded\n * @param frameLength Length of each frame\n * @param frameStep The frame hop size in samples.\n * @param padEnd Whether to pad the end of signal with padValue.\n * @param padValue An number to use where the input signal does\n * not exist when padEnd is True.\n * @doc {heading: 'Operations', subheading:
```

```
'Signal', namespace: 'signal')\n *\nfunction frame_(\n  signal: Tensor1D, frameLength: number, frameStep:
number, padEnd = false,\n  padValue = 0): Tensor {\n  let start = 0;\n  const output: Tensor[] = [];\n  while (start +
frameLength <= signal.size) {\n    output.push(slice(signal, start, frameLength));\n    start += frameStep;\n  }\n  if
(padEnd) {\n    while (start < signal.size) {\n      const padLen = (start + frameLength) - signal.size;\n      const pad =
concat([\n        slice(signal, start, frameLength - padLen), fill([padLen], padValue)\n      ]);\n      output.push(pad);\n      start += frameStep;\n    }\n  }\n  if (output.length === 0) {\n    return tensor2d([], [0, frameLength]);\n  }\n  return reshape(concat(output), [output.length, frameLength]);\n}\nexport const frame = op({ frame_ });\n", "/*\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport {Tensor, Tensor1D} from '../tensor';\nimport {concat} from '../concat';\nimport {mul} from
 '../mul';\nimport {op} from '../operation';\nimport {enclosingPowerOfTwo} from '../signal_ops_util';\nimport {slice}
from '../slice';\nimport {rfft} from '../spectral/rfft';\nimport {frame} from './frame';\nimport {hannWindow} from
 './hann_window';\n\n/**\n * Computes the Short-time Fourier Transform of signals\n * See:
https://en.wikipedia.org/wiki/Short-time_Fourier_transform\n *\n * ``js\n * const input = tf.tensor1d([1, 1, 1, 1,
1])\n * tf.signal.stft(input, 3, 1).print();\n *\n * @param signal 1-dimensional real value tensor.\n * @param
frameLength The window length of samples.\n * @param frameStep The number of samples to step.\n * @param
fftLength The size of the FFT to apply.\n * @param windowFn A callable that takes a window length and returns 1-
d tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n *\nfunction stft_(\n
signal: Tensor1D, frameLength: number, frameStep: number,\n  fftLength?: number,\n  windowFn: (length:
number) => Tensor1D = hannWindow): Tensor {\n  if (fftLength == null) {\n    fftLength =
enclosingPowerOfTwo(frameLength);\n  }\n  const framedSignal = frame(signal, frameLength, frameStep);\n  const
windowedSignal = mul(framedSignal, windowFn(frameLength));\n  const output: Tensor[] = [];\n  for (let i = 0; i <
framedSignal.shape[0]; i++) {\n    output.push(\n      rfft(slice(windowedSignal, [i, 0], [1, frameLength]),
fftLength);\n    }\n  }\n  return concat(output);\n}\nexport const stft = op({ stft_ });\n", "/*\n *
@license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport {ENGINE} from '../engine';\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs}
from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D, Tensor2D,
Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor}
from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op}
from '../operation';\n\n/**\n * Extracts crops from the input image tensor and resizes them using bilinear\n *
sampling or nearest neighbor sampling (possibly with aspect ratio change)\n * to a common output size specified by
cropSize.\n *\n * @param image 4d tensor of shape `[batch,imageHeight,imageWidth, depth]`,\n * where
imageHeight and imageWidth must be positive, specifying the\n * batch of images from which to take crops\n *\n *
@param boxes 2d float32 tensor of shape `[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)`
and `(y2, x2)` are the normalized\n * coordinates of the box in the boxInd[i]'th image in the batch\n *\n *
@param boxInd 1d int32 tensor of shape `[numBoxes]` with values in range\n * `[0, batch)` that specifies the image that
the `i`-th box refers to.\n *\n * @param cropSize 1d int32 tensor of 2 elements `[cropHeigh, cropWidth]`\n *
```

```

specifying the size to which all crops are resized to.\n * @param method Optional string from `bilinear` |
'nearest',\n * defaults to bilinear, which specifies the sampling method for resizing\n * @param
extrapolationValue A threshold for deciding when to remove boxes based\n * on score. Defaults to 0.\n * @return
A 4D tensor of the shape `[numBoxes,cropHeight,cropWidth,depth]`\n *\n * @doc {heading: 'Operations',
subheading: 'Images', namespace: 'image'}\n *\nfunction cropAndResize_(\n image: Tensor4D|TensorLike,\n
boxes: Tensor2D|TensorLike,\n boxInd: Tensor1D|TensorLike,\n cropSize: [number, number],\n method:
'bilinear'|'nearest' = 'bilinear',\n extrapolationValue = 0,\n ): Tensor4D {\n const $image =
convertToTensor(image, 'image', 'cropAndResize');\n const $boxes = convertToTensor(boxes, 'boxes',
'cropAndResize', 'float32');\n const $boxInd = convertToTensor(boxInd, 'boxInd', 'cropAndResize', 'int32');\n\n
const numBoxes = $boxes.shape[0];\n\n util.assert(\n $image.rank === 4,\n () => `Error in cropAndResize:
image must be rank 4,` +\n `but got rank ${$image.rank}.`);\n util.assert(\n $boxes.rank === 2 &&
$boxes.shape[1] === 4,\n () => `Error in cropAndResize: boxes must be have size [${numBoxes},4]` +\n
`but had shape ${$boxes.shape}.`);\n util.assert(\n $boxInd.rank === 1 && $boxInd.shape[0] === numBoxes,\n
() => `Error in cropAndResize: boxInd must be have size [${numBoxes}]` +\n `but had shape
${$boxes.shape}.`);\n util.assert(\n cropSize.length === 2,\n () => `Error in cropAndResize: cropSize must
be of length 2, but got ` +\n `length ${cropSize.length}.`);\n util.assert(\n cropSize[0] >= 1 && cropSize[1]
>= 1,\n () => `cropSize must be atleast [1,1], but was ${cropSize}`);\n util.assert(\n method === 'bilinear' ||
method === 'nearest',\n () => `method must be bilinear or nearest, but was ${method}`);\n\n const inputs:\n
CropAndResizeInputs = {image: $image, boxes: $boxes, boxInd: $boxInd};\n const attrs: CropAndResizeAttrs =
{method, extrapolationValue, cropSize};\n const res = ENGINE.runKernel(\n CropAndResize, inputs as {} as
NamedTensorMap,\n attrs as {} as NamedAttrMap);\n return res as Tensor4D;\n}\n\nexport const
cropAndResize = op({cropAndResize_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {ENGINE} from '../engine';\nimport {FlipLeftRight, FlipLeftRightInputs} from
'../kernel_names';\nimport {Tensor4D} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\nimport * as util from '../util';\nimport {op} from './operation';\n/**\n * Flips the image left to right.
Currently available in the CPU, WebGL, and\n * WASM backends.\n *\n * @param image 4d tensor of shape
`[batch, imageHeight, imageWidth, depth]`\n *\n * @doc {heading: 'Operations', subheading: 'Images',
namespace: 'image'} *\nfunction flipLeftRight_(image: Tensor4D|TensorLike): Tensor4D {\n const $image =
convertToTensor(image, 'image', 'flipLeftRight', 'float32');\n\n util.assert(\n $image.rank === 4,\n () => `Error
in flipLeftRight: image must be rank 4,` +\n `but got rank ${$image.rank}.`);\n\n const inputs:\n
FlipLeftRightInputs = {image: $image};\n const res =\n ENGINE.runKernel(FlipLeftRight, inputs as {} as
NamedTensorMap, {});\n return res as Tensor4D;\n}\n\nexport const flipLeftRight =
op({flipLeftRight_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====

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*\n\nimport {ENGINE} from '../engine';\nimport {RotateWithOffset, RotateWithOffsetAttrs,
RotateWithOffsetInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport
{Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor}
from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op}
from './operation';\n\n/**\n * Rotates the input image tensor counter-clockwise with an optional offset\n * center of
rotation. Currently available in the CPU, WebGL, and WASM backends.\n * \n * @param image 4d tensor of shape
`[batch, imageHeight, imageWidth, depth]`\n * @param radians The amount of rotation.\n * @param fillValue The
value to fill in the empty space leftover\n * after rotation. Can be either a single grayscale value (0-255), or an\n *
array of three numbers `[red, green, blue]` specifying the red, green,\n * and blue channels. Defaults to `0`
(black).\n * @param center The center of rotation. Can be either a single value (0-1), or\n * an array of two
numbers `[centerX, centerY]`. Defaults to `0.5` (rotates\n * the image around its center).\n * \n * @doc {heading:
'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction rotateWithOffset_(\n  image:
Tensor4D|TensorLike, radians: number,\n  fillValue: number|[number, number, number] = 0,\n  center:
number|[number, number] = 0.5): Tensor4D {\n  const $image = convertToTensor(image, 'image',
'rotateWithOffset', 'float32');\n\n  util.assert(\n    $image.rank === 4,\n    () => 'Error in rotateWithOffset: image
must be rank 4,' +\n    `but got rank ${$image.rank}`);\n\n  const inputs: RotateWithOffsetInputs = {image:
$image};\n  const attrs: RotateWithOffsetAttrs = {radians, fillValue, center};\n  const res = ENGINE.runKernel(\n
  RotateWithOffset, inputs as {} as NamedTensorMap,\n  attrs as {} as NamedAttrMap);\n  return res as
Tensor4D;\n}\n\nexport const rotateWithOffset = op({rotateWithOffset_});\n", /**\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport * as util from '../util';\n\nfunction
nonMaxSuppSanityCheck(\n  boxes: Tensor2D, scores: Tensor1D, maxOutputSize: number,\n  iouThreshold:
number, scoreThreshold: number, softNmsSigma?: number): {\n  maxOutputSize: number,\n  iouThreshold:
number,\n  scoreThreshold: number,\n  softNmsSigma: number\n} {\n  if (iouThreshold == null) {\n    iouThreshold
= 0.5;\n  }\n  if (scoreThreshold == null) {\n    scoreThreshold = Number.NEGATIVE_INFINITY;\n  }\n  if
(softNmsSigma == null) {\n    softNmsSigma = 0.0;\n  }\n\n  const numBoxes = boxes.shape[0];\n  maxOutputSize
= Math.min(maxOutputSize, numBoxes);\n\n  util.assert(\n    0 <= iouThreshold && iouThreshold <= 1,\n    () =>
`iouThreshold must be in [0, 1], but was '${iouThreshold}`);\n  util.assert(\n    boxes.rank === 2,\n    () => `boxes
must be a 2D tensor, but was of rank '${boxes.rank}`);\n  util.assert(\n    boxes.shape[1] === 4,\n    () => \n
`boxes must have 4 columns, but 2nd dimension was ${boxes.shape[1]}`);\n  util.assert(scores.rank === 1, () =>
'scores must be a 1D tensor');\n  util.assert(\n    scores.shape[0] === numBoxes,\n    () => `scores has
incompatible shape with boxes. Expected ${numBoxes}, ` +\n    `but was ${scores.shape[0]}`);\n  util.assert(\n
  0 <= softNmsSigma && softNmsSigma <= 1,\n    () => `softNmsSigma must be in [0, 1], but was
`${softNmsSigma}`);\n  return {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n}\n\nexport
{nonMaxSuppSanityCheck};\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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{\n let left = 0;\n let right = arr.length;\n let middle = 0;\n let found = false;\n while (left < right) {\n middle =
left + ((right - left) >>> 1);\n const compareResult = comparator(target, arr[middle]);\n if (compareResult > 0)
{\n left = middle + 1;\n } else {\n right = middle;\n // If compareResult is 0, the value is found. We
record it is found,\n // and then keep looking because there may be duplicate.\n found = !compareResult;\n
}\n }\n\n return found ? left : -left - 1;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {TypedArray} from './types';\nimport {binaryInsert} from './non_max_suppression_util';\n\n/*\n * Implementation of the NonMaxSuppression kernel shared between webgl and cpu.\n */\n\ninterface Candidate {\n
score: number;\n boxIndex: number;\n suppressBeginIndex: number;\n}\n\ninterface NonMaxSuppressionResult {\n
selectedIndices: number[];\n selectedScores?: number[];\n validOutputs?: number;\n}\n\nexport function
nonMaxSuppressionV3Impl(\n boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n
iouThreshold: number, scoreThreshold: number): NonMaxSuppressionResult {\n return
nonMaxSuppressionImpl_(\n boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n 0 /*
softNmsSigma */);\n}\n\nexport function nonMaxSuppressionV4Impl(\n boxes: TypedArray, scores: TypedArray,\n
maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean):
NonMaxSuppressionResult {\n return nonMaxSuppressionImpl_(\n boxes, scores, maxOutputSize,\n
iouThreshold, scoreThreshold,\n 0 /* softNmsSigma */, false /* returnScoresTensor */,\n
padToMaxOutputSize /* padToMaxOutputSize */, true\n /* returnValidOutputs */);\n}\n\nexport function
nonMaxSuppressionV5Impl(\n boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n
iouThreshold: number, scoreThreshold: number,\n softNmsSigma: number): NonMaxSuppressionResult {\n
return nonMaxSuppressionImpl_(\n boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n
softNmsSigma,\n true /* returnScoresTensor */);\n}\n\nfunction nonMaxSuppressionImpl_(\n boxes:
TypedArray, scores: TypedArray, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n
softNmsSigma: number,\n returnScoresTensor = false, padToMaxOutputSize = false,\n returnValidOutputs =
false): NonMaxSuppressionResult {\n // The list is sorted in ascending order, so that we can always pop the\n //
candidate with the largest score in O(1) time.\n const candidates = [];\n\n for (let i = 0; i < scores.length; i++) {\n
if (scores[i] > scoreThreshold) {\n candidates.push({score: scores[i], boxIndex: i, suppressBeginIndex: 0});\n
}\n }\n\n candidates.sort(ascendingComparator);\n\n // If softNmsSigma is 0, the outcome of this algorithm is
exactly same as\n // before.\n const scale = softNmsSigma > 0 ? (-0.5 / softNmsSigma) : 0.0;\n\n const
selectedIndices: number[] = [];\n const selectedScores: number[] = [];\n\n while (selectedIndices.length <
maxOutputSize && candidates.length > 0) {\n const candidate = candidates.pop();\n const {score: originalScore,\n
boxIndex, suppressBeginIndex} = candidate;\n\n if (originalScore < scoreThreshold) {\n break;\n }\n\n //
Overlapping boxes are likely to have similar scores, therefore we\n // iterate through the previously selected boxes
backwards in order to\n // see if candidate's score should be suppressed. We use\n // suppressBeginIndex to track
and ensure a candidate can be suppressed\n // by a selected box no more than once. Also, if the overlap exceeds\n
// iouThreshold, we simply ignore the candidate.\n let ignoreCandidate = false;\n for (let j =
selectedIndices.length - 1; j >= suppressBeginIndex; --j) {\n const iou = intersectionOverUnion(boxes, boxIndex,\n
selectedIndices[j]);\n\n if (iou >= iouThreshold) {\n ignoreCandidate = true;\n break;\n }\n\n
candidate.score =\n candidate.score * suppressWeight(iouThreshold, scale, iou);\n\n if (candidate.score <=
scoreThreshold) {\n break;\n }\n }\n\n // At this point, if `candidate.score` has not dropped below\n //
`scoreThreshold`, then we know that we went through all of the\n // previous selections and can safely update
`suppressBeginIndex` to the\n // end of the selected array. Then we can re-insert the candidate with\n // the

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updated score and suppressBeginIndex back in the candidate list.\n // If on the other hand, `candidate.score` has
dropped below the score\n // threshold, we will not add it back to the candidates list.\n
candidate.suppressBeginIndex = selectedIndices.length;\n\n if (!ignoreCandidate) {\n // Candidate has passed
all the tests, and is not suppressed, so\n // select the candidate.\n if (candidate.score === originalScore) {\n
selectedIndices.push(boxIndex);\n selectedScores.push(candidate.score);\n } else if (candidate.score >
scoreThreshold) {\n // Candidate's score is suppressed but is still high enough to be\n // considered, so add
back to the candidates list.\n binaryInsert(candidates, candidate, ascendingComparator);\n }\n }\n }\n\n //
NonMaxSuppressionV4 feature: padding output to maxOutputSize.\n const validOutputs = selectedIndices.length;\n
const elemsToPad = maxOutputSize - validOutputs;\n\n if (padToMaxOutputSize && elemsToPad > 0) {\n
selectedIndices.push(...new Array(elemsToPad).fill(0));\n selectedScores.push(...new
Array(elemsToPad).fill(0.0));\n }\n\n const result: NonMaxSuppressionResult = {selectedIndices};\n\n if
(returnScoresTensor) {\n result['selectedScores'] = selectedScores;\n }\n\n if (returnValidOutputs) {\n
result['validOutputs'] = validOutputs;\n }\n\n return result;\n}\n\nfunction intersectionOverUnion(boxes:
TypedArray, i: number, j: number) {\n const iCoord = boxes.subarray(i * 4, i * 4 + 4);\n const jCoord =
boxes.subarray(j * 4, j * 4 + 4);\n const yminI = Math.min(iCoord[0], iCoord[2]);\n const xminI =
Math.min(iCoord[1], iCoord[3]);\n const ymaxI = Math.max(iCoord[0], iCoord[2]);\n const xmaxI =
Math.max(iCoord[1], iCoord[3]);\n const yminJ = Math.min(jCoord[0], jCoord[2]);\n const xminJ =
Math.min(jCoord[1], jCoord[3]);\n const ymaxJ = Math.max(jCoord[0], jCoord[2]);\n const xmaxJ =
Math.max(jCoord[1], jCoord[3]);\n const areaI = (ymaxI - yminI) * (xmaxI - xminI);\n const areaJ = (ymaxJ -
yminJ) * (xmaxJ - xminJ);\n if (areaI <= 0 || areaJ <= 0) {\n return 0.0;\n }\n const intersectionYmin =
Math.max(yminI, yminJ);\n const intersectionXmin = Math.max(xminI, xminJ);\n const intersectionYmax =
Math.min(ymaxI, ymaxJ);\n const intersectionXmax = Math.min(xmaxI, xmaxJ);\n const intersectionArea =
Math.max(intersectionYmax - intersectionYmin, 0.0) * Math.max(intersectionXmax - intersectionXmin,
0.0);\n return intersectionArea / (areaI + areaJ - intersectionArea);\n}\n\n// A Gaussian penalty function, this
method always returns values in [0, 1].\n// The weight is a function of similarity, the more overlap two boxes are,
the\n// smaller the weight is, meaning highly overlapping boxes will be significantly\n// penalized. On the other hand,
a non-overlapping box will not be penalized.\nfunction suppressWeight(iouThreshold: number, scale: number, iou:
number) {\n const weight = Math.exp(scale * iou * iou);\n return iou <= iouThreshold ? weight :
0.0;\n}\n\nfunction ascendingComparator(c1: Candidate, c2: Candidate) {\n // For objects with same scores, we
make the object with the larger index go\n // first. In an array that pops from the end, this means that the object
with\n // the smaller index will be popped first. This ensures the same output as\n // the TensorFlow python
version.\n return (c1.score - c2.score) ||\n ((c1.score === c2.score) && (c2.boxIndex -
c1.boxIndex));\n}\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====*\n\nimport {nonMaxSuppressionV3Impl} from '../backends/non_max_suppression_impl';\nimport {Tensor1D,
Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {tensor1d} from
'../tensor1d';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over
union).\n *\n * This is the async version of `nonMaxSuppression`\n *\n * @param boxes a 2d tensor of shape
`[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n * the
bounding box.\n *\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n *\n * @param
maxOutputSize The maximum number of boxes to be selected.\n *\n * @param iouThreshold A float representing the

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threshold for deciding whether boxes overlap too much with respect to IOU. Must be between [0, 1].
Defaults to 0.5 (50% box overlap).
@param scoreThreshold A threshold for deciding when to remove boxes
based on score. Defaults to -inf, which means any score is accepted.
@return A 1D tensor with the
selected box indices.
@doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}
function nonMaxSuppressionAsync_(
  boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,
  maxOutputSize: number, iouThreshold = 0.5,
  scoreThreshold = Number.NEGATIVE_INFINITY):
  Promise<Tensor1D> {
    const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');
    const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');
    const inputs =
      nonMaxSuppSanityCheck($boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold);
    maxOutputSize = inputs.maxOutputSize;
    iouThreshold = inputs.iouThreshold;
    scoreThreshold = inputs.scoreThreshold;
    const boxesAndScores = await Promise.all([$boxes.data(), $scores.data()]);
    const boxesVals = boxesAndScores[0];
    const scoresVals = boxesAndScores[1];
    // We call a cpu based impl directly with the
    typedarray data here rather than a kernel because all kernels are synchronous (and thus cannot await
    // .data()).
    const {selectedIndices} = nonMaxSuppressionV3Impl(boxesVals, scoresVals, maxOutputSize,
    iouThreshold, scoreThreshold);
    if ($boxes !== boxes) {$boxes.dispose();}
    if ($scores !== scores) {$scores.dispose();}
    return tensor1d(selectedIndices, 'int32');
  }
  export const nonMaxSuppressionAsync =
  nonMaxSuppressionAsync_;
  /**
   * @license
   * Copyright 2020 Google LLC. All Rights Reserved.
   * Licensed under the Apache License, Version 2.0 (the "License");
   * you may not use this file except in
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   * You may obtain a copy of the License at
   * http://www.apache.org/licenses/LICENSE-2.0
   * Unless required by applicable law or agreed to in writing,
   * software distributed under the License is distributed on an "AS IS" BASIS,
   * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
   * See the License for the specific language
   * governing permissions and limitations under the License.
   */
  =====
  *
  * import {ENGINE} from '../engine';
  * import {NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
  * NonMaxSuppressionV5Inputs} from '../kernel_names';
  * import {NamedAttrMap} from
  * '../kernel_registry';
  * import {Tensor, Tensor1D, Tensor2D} from '../tensor';
  * import {NamedTensorMap} from
  * '../tensor_types';
  * import {convertToTensor} from '../tensor_util_env';
  * import {TensorLike} from
  * '../types';
  * import {nonMaxSuppSanityCheck} from './nonmax_util';
  * import {op} from './operation';
  *
  * Performs non maximum suppression of bounding boxes based on iou (intersection over union).
  * This op
  * also supports a Soft-NMS mode (c.f. Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the
  * score of other overlapping boxes, therefore favoring different regions of the image with high scores. To
  * enable this Soft-NMS mode, set the `softNmsSigma` parameter to be larger than 0.
  * @param boxes a 2d
  * tensor of shape `[numBoxes, 4]`. Each entry is `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the
  * corners of the bounding box.
  * @param scores a 1d tensor providing the box scores of shape
  * `[numBoxes]`.
  * @param maxOutputSize The maximum number of boxes to be selected.
  * @param
  * iouThreshold A float representing the threshold for deciding whether boxes overlap too much with respect to
  * IOU. Must be between [0, 1]. Defaults to 0.5 (50% box overlap).
  * @param scoreThreshold A threshold for
  * deciding when to remove boxes based on score. Defaults to -inf, which means any score is accepted.
  * @param softNmsSigma A float representing the sigma parameter for Soft NMS. When sigma is 0, it falls
  * back to nonMaxSuppression.
  * @return A map with the following properties:
  * - selectedIndices: A 1D tensor
  * with the selected box indices.
  * - selectedScores: A 1D tensor with the corresponding scores for each
  * selected box.
  * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}
  *
  * function
  * nonMaxSuppressionWithScore_(
  *   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,
  *   maxOutputSize: number, iouThreshold = 0.5,
  *   scoreThreshold = Number.NEGATIVE_INFINITY,
  *   softNmsSigma = 0.0): NamedTensorMap {
  *   const $boxes = convertToTensor(boxes, 'boxes',
  * 'nonMaxSuppression');
  *   const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');
  *   const
  *   params = nonMaxSuppSanityCheck($boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,
  *

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softNmsSigma);\n maxOutputSize = params.maxOutputSize;\n iouThreshold = params.iouThreshold;\n
scoreThreshold = params.scoreThreshold;\n softNmsSigma = params.softNmsSigma;\n\n const inputs:
NonMaxSuppressionV5Inputs = { boxes: $boxes, scores: $scores};\n const attrs: NonMaxSuppressionV5Attrs =\n
{ maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n\n // tslint:disable-next-line: no-unnecessary-
type-assertion\n const result = ENGINE.runKernel(\n          NonMaxSuppressionV5, inputs as {} as
NamedTensorMap,\n          attrs as {} as NamedAttrMap) as Tensor[];\n\n return { selectedIndices: result[0],
selectedScores: result[1]};\n}\n\nexport const nonMaxSuppressionWithScore =
op({ nonMaxSuppressionWithScore_ });\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\nimport { nonMaxSuppressionV5Impl } from '../backends/non_max_suppression_impl';\nimport { Tensor1D,
Tensor2D } from '../tensor';\nimport { NamedTensorMap } from '../tensor_types';\nimport { convertToTensor }
from '../tensor_util_env';\nimport { TensorLike } from '../types';\nimport { nonMaxSuppSanityCheck } from
'../nonmax_util';\nimport { tensor1d } from '../tensor1d';\n\n/**\n * Asynchronously performs non maximum
suppression of bounding boxes based on\n * iou (intersection over union).\n * This op also supports a Soft-NMS
mode (c.f.\n * Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the score\n * of other overlapping
boxes, therefore favoring different regions of the image\n * with high scores. To enable this Soft-NMS mode, set the
`softNmsSigma`\n * parameter to be larger than 0.\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`.\n
Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n * the bounding box.\n
* @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The
maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding
whether\n * boxes overlap too much with respect to IOU. Must be between [0, 1].\n * Defaults to 0.5 (50% box
overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n * on score.
Defaults to -inf, which means any score is accepted.\n * @param softNmsSigma A float representing the sigma
parameter for Soft NMS.\n * When sigma is 0, it falls back to nonMaxSuppression.\n * @return A map with the
following properties:\n * - selectedIndices: A 1D tensor with the selected box indices.\n * - selectedScores: A
1D tensor with the corresponding scores for each\n * selected box.\n *\n * @doc {heading: 'Operations',
subheading: 'Images', namespace: 'image'}\n */\n\nexport function nonMaxSuppressionWithScoreAsync(\n boxes:
Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n maxOutputSize: number, iouThreshold = 0.5,\n scoreThreshold =
Number.NEGATIVE_INFINITY,\n softNmsSigma = 0.0): Promise<NamedTensorMap> {\n
const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');\n const $scores =
convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');\n const params = nonMaxSuppSanityCheck(\n
$boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n maxOutputSize =
params.maxOutputSize;\n iouThreshold = params.iouThreshold;\n scoreThreshold = params.scoreThreshold;\n
softNmsSigma = params.softNmsSigma;\n\n const boxesAndScores = await Promise.all([$boxes.data(),
$scores.data()]);\n const boxesVals = boxesAndScores[0];\n const scoresVals = boxesAndScores[1];\n\n // We call
a cpu based impl directly with the typedarray data here rather\n // than a kernel because all kernels are synchronous
(and thus cannot await\n // .data()).\n const { selectedIndices, selectedScores } = nonMaxSuppressionV5Impl(\n
boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n if ($boxes !==
boxes) {\n $boxes.dispose();\n }\n if ($scores !== scores) {\n $scores.dispose();\n }\n\n return {\n
selectedIndices: tensor1d(selectedIndices, 'int32'),\n selectedScores: tensor1d(selectedScores)\n };\n}\n\nexport
const nonMaxSuppressionWithScoreAsync = nonMaxSuppressionWithScoreAsync;\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the

```

"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {ENGINE} from '../engine';\nimport {NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor, Tensor1D, Tensor2D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {nonMaxSuppSanityCheck} from './nonmax_util';\nimport {op} from './operation';\n\n/**\n * Asynchronously performs non maximum suppression of bounding boxes based on\n * iou (intersection over union), with an option to pad results.\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n * the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxSize The maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding whether\n * boxes overlap too much with respect to IOU. Must be between [0, 1].\n * Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n * on score. Defaults to -inf, which means any score is accepted.\n * @param padToMaxOutputSize Defaults to false. If true, size of output\n * `selectedIndices` is padded to maxSize.\n * @return A map with the following properties:\n * - selectedIndices: A 1D tensor with the selected box indices.\n * - validOutputs: A scalar denoting how many elements in `selectedIndices`\n * are valid. Valid elements occur first, then padding.\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction nonMaxSuppressionPadded_(\n  boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n  maxSize: number, iouThreshold = 0.5,\n  scoreThreshold = Number.NEGATIVE_INFINITY,\n  padToMaxOutputSize = false): NamedTensorMap {\n  const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n  const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n  const params = nonMaxSuppSanityCheck(\n    $boxes, $scores, maxSize, iouThreshold, scoreThreshold,\n    null /* softNmsSigma */);\n  const $maxOutputSize = params.maxOutputSize;\n  const $iouThreshold = params.iouThreshold;\n  const $scoreThreshold = params.scoreThreshold;\n  const inputs: NonMaxSuppressionV4Inputs = {boxes: $boxes, scores: $scores};\n  const attrs: NonMaxSuppressionV4Attrs = {\n    maxSize: $maxOutputSize,\n    iouThreshold: $iouThreshold,\n    scoreThreshold: $scoreThreshold,\n    padToMaxOutputSize\n  }; // tslint:disable-next-line\n  no-unnecessary-type-assertion\n  const result = ENGINE.runKernel(\n    NonMaxSuppressionV4, inputs as {\n    } as NamedTensorMap,\n    attrs as {\n    } as NamedAttrMap) as Tensor[];\n  return {selectedIndices: result[0], validOutputs: result[1]};\n}\n\nexport const nonMaxSuppressionPadded =\n  op({nonMaxSuppressionPadded_});\n\n/**\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {nonMaxSuppressionV4Impl} from '../backends/non_max_suppression_impl';\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {nonMaxSuppSanityCheck} from './nonmax_util';\nimport {scalar} from './scalar';\nimport {tensor1d} from './tensor1d';\n\n/**\n * Asynchronously performs non maximum suppression of bounding boxes based on\n * iou (intersection over union), with an option to
```



```

util.assert(\n    size.length === 2,\n    () => `Error in resizeBilinear: new shape must 2D, but got shape ` +\n
` ${size}.`);
util.assert(\n    halfPixelCenters === false || alignCorners === false,\n    () => `Error in
resizeBilinear: If halfPixelCenters is true, ` +\n
`alignCorners must be false.`);
let batchImages = $images
as Tensor4D;
let reshapedTo4D = false;
if ($images.rank === 3) {\n
    reshapedTo4D = true;\n
    batchImages
= reshape(\n
    $images, [1, $images.shape[0], $images.shape[1], $images.shape[2]]);\n
}
const [] = size;
const inputs: ResizeBilinearInputs = {images: batchImages};
const attrs: ResizeBilinearAttrs = {alignCorners,
halfPixelCenters, size};
// tslint:disable-next-line: no-unnecessary-type-assertion
const res =
ENGINE.runKernel(\n
    ResizeBilinear, inputs as {} as NamedTensorMap,\n
    attrs as {} as
NamedAttrMap) as T;
if (reshapedTo4D) {\n
    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as
T;\n
}
return res;
}
export const resizeBilinear = op({resizeBilinear_});
"/**\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/
import {ENGINE} from '../engine';
import {ResizeNearestNeighbor, ResizeNearestNeighborAttrs,
ResizeNearestNeighborInputs} from '../kernel_names';
import {NamedAttrMap} from
'../kernel_registry';
import {Tensor3D, Tensor4D} from '../tensor';
import {NamedTensorMap} from
'../tensor_types';
import {convertToTensor} from '../tensor_util_env';
import {TensorLike} from
'../types';
import * as util from '../util';
import {op} from '../operation';
import {reshape} from
'../reshape';
/**\n * NearestNeighbor resize a batch of 3D images to a new shape.\n * @param images The
images, of rank 4 or rank 3, of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n *
@param size The new shape `[newHeight, newWidth]` to resize the\n * images to. Each channel is resized
individually.\n * @param alignCorners Defaults to False. If true, rescale\n * input by `(new_height - 1) / (height -
1)`, which exactly aligns the\n * corners of images and resized images. If false, rescale by\n * `new_height /
height`. Treat similarly the width dimension.\n * @param halfPixelCenters Defaults to `false`. Whether to assumes
pixels are of\n * half the actual dimensions, and yields more accurate resizes. This flag\n * would also make
the floating point coordinates of the top left pixel\n * 0.5, 0.5.\n * @doc {heading: 'Operations', subheading:
'Images', namespace: 'image'}
function resizeNearestNeighbor_<T extends Tensor3D|Tensor4D>(\n
images:
T|TensorLike, size: [number, number], alignCorners = false,\n
halfPixelCenters = false): T {\n
const $images =
convertToTensor(images, 'images', 'resizeNearestNeighbor');
util.assert(\n
    $images.rank === 3 ||
$images.rank === 4,\n
    () => `Error in resizeNearestNeighbor: x must be rank 3 or 4, but got ` +\n
`rank
${$images.rank}.`);
util.assert(\n
    size.length === 2,\n
    () => `Error in resizeNearestNeighbor: new
shape must 2D, but got shape ` +\n
` ${size}.`);
util.assert(\n
    $images.dtype === 'float32' || $images.dtype
=== 'int32',\n
    () => `images` must have `int32` or `float32` as dtype`);
util.assert(\n
    halfPixelCenters ===
false || alignCorners === false,\n
    () => `Error in resizeNearestNeighbor: If halfPixelCenters is true, ` +\n
`alignCorners must be false.`);
let batchImages = $images as Tensor4D;
let reshapedTo4D = false;
if ($images.rank === 3) {\n
    reshapedTo4D = true;\n
    batchImages = reshape(\n
    $images, [1, $images.shape[0],
$images.shape[1], $images.shape[2]]);\n
}
const [] = size;
const inputs: ResizeNearestNeighborInputs =
{images: batchImages};
const attrs:\n
    ResizeNearestNeighborAttrs = {alignCorners, halfPixelCenters,
size};
// tslint:disable-next-line: no-unnecessary-type-assertion
const res = ENGINE.runKernel(\n
    ResizeNearestNeighbor, inputs as {} as NamedTensorMap,\n
    attrs as {} as NamedAttrMap) as T;
if (reshapedTo4D) {\n
    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n
}
return
res;
}
export const resizeNearestNeighbor = op({resizeNearestNeighbor_});
"/**\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *

```


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```
=====
\n
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assert} from '../util';\nimport {greaterEqual} from
../greater_equal';\nimport {lessEqual} from '../less_equal';\nimport {logicalAnd} from '../logical_and';\nimport {op}
from '../operation';\nimport {range} from '../range';\nimport {reshape} from '../reshape';\nimport {scalar} from
../scalar';\nimport {stack} from '../stack';\nimport {sub} from '../sub';\nimport {unstack} from '../unstack';\nimport
{where} from '../where';\nimport {zeros} from '../zeros';\n\n**\n * Copy a tensor setting everything outside a
central band in each innermost\n * matrix to zero.\n *\n * The band part is computed as follows: Assume input has
`k` dimensions\n * `[I, J, K, ..., M, N]`, then the output is a tensor with the same shape where\n * `band[i, j, k, ..., m,
n] = in_band(m, n) * input[i, j, k, ..., m, n]`.\n * The indicator function\n * `in_band(m, n) = (num_lower < 0 || (m-n)
<= num_lower))\n * && (num_upper < 0 || (n-m) <= num_upper)`\n *\n * ```js\n * const x = tf.tensor2d([[ 0, 1,
2, 3],\n *      [-1, 0, 1, 2],\n *      [-2, -1, 0, 1],\n *      [-3, -2, -1, 0]]);\n * let y =
tf.linalg.bandPart(x, 1, -1);\n * y.print(); // [[ 0, 1, 2, 3],\n *      // [-1, 0, 1, 2],\n *      // [ 0, -1, 0, 1],\n *
// [ 0, 0, -1, 0]]\n * let z = tf.linalg.bandPart(x, 2, 1);\n * z.print(); // [[ 0, 1, 0, 0],\n *      // [-1, 0, 1, 0],\n *
// [-2, -1, 0, 1],\n *      // [ 0, -2, -1, 0]]\n *\n * @param x Rank `k` tensor\n * @param
numLower Number of subdiagonals to keep.\n * If negative, keep entire lower triangle.\n * @param numUpper
Number of subdiagonals to keep.\n * If negative, keep entire upper triangle.\n * @returns Rank `k` tensor of the
same shape as input.\n * The extracted banded tensor.\n *\n * @doc {heading:'Operations', subheading:'Linear
Algebra', namespace:'linalg'}\n\nfunction bandPart_<T extends Tensor>(\n  a: T|TensorLike, numLower:
number, numUpper: number): T {\n  assert(\n    numLower % 1 === 0,\n    () => `bandPart(): numLower must be
an integer, got ${numLower}.`);\n  assert(\n    numUpper % 1 === 0,\n    () => `bandPart(): numUpper must be an
integer, got ${numUpper}.`);\n\n  const $a = convertToTensor(a, 'a', 'bandPart');\n  assert(\n    $a.rank >= 2,\n    () => `bandPart(): Rank must be at least 2, got ${$a.rank}.`);\n\n  const shape = $a.shape;\n  const [M, N] =
$a.shape.slice(-2);\n  if (!(numLower <= M)) {\n    throw new Error(\n      `bandPart(): numLower
(${numLower})\n      ` must not be greater than the number of rows (${M}).`);\n  }\n  if (!(numUpper <= N))
{\n    throw new Error(\n      `bandPart(): numUpper (${numUpper})\n      ` must not be greater than the
number of columns (${N}).`);\n  }\n  if (numLower < 0) {\n    numLower = M;\n  }\n  if (numUpper < 0) {\n
numUpper = N;\n  }\n\n  const i = reshape(range(0, M, 1, 'int32'), [-1, 1]);\n  const j = range(0, N, 1, 'int32');\n  const
ij = sub(i, j);\n  const inBand = logicalAnd(\n    lessEqual(ij, scalar(+numLower, 'int32')),\n    greaterEqual(ij,
scalar(-numUpper, 'int32')));\n\n  const zero = zeros([M, N], $a.dtype);\n\n  return reshape(\n
stack(unstack(reshape($a, [-1, M, N]))\n      .map(mat => where(inBand, mat, zero))),\n    shape) as
T;\n}\n\nexport const bandPart = op({bandPart_});\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====
\n
*\n\nimport {ENGINE} from '../engine';\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {assert} from
../util';\nimport {div} from '../div';\nimport {mul} from '../mul';\nimport {norm} from '../norm';\nimport {op}
from '../operation';\nimport {split} from '../split';\nimport {squeeze} from '../squeeze';\nimport {stack} from
../stack';\nimport {sub} from '../sub';\nimport {sum} from '../sum';\n\n**\n * Gram-Schmidt orthogonalization.\n *\n *
```js\n * const x = tf.tensor2d([[1, 2], [3, 4]]);\n * let y = tf.linalg.gramSchmidt(x);\n * y.print();\n *

```

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console.log('Orthogonalized:');\n * y.dot(y.transpose()).print(); // should be nearly the identity matrix.\n *
console.log('First row direction maintained:');\n * const data = await y.array();\n * console.log(data[0][1] /
data[0][0]); // should be nearly 2.\n * ``\n * \n * @param xs The vectors to be orthogonalized, in one of the two
following\n * formats:\n * - An Array of `tf.Tensor1D`.\n * - A `tf.Tensor2D`, i.e., a matrix, in which case the
vectors are the rows\n * of `xs`.\n * In each case, all the vectors must have the same length and the length\n *
must be greater than or equal to the number of vectors.\n * @returns The orthogonalized and normalized vectors or
matrix.\n * Orthogonalization means that the vectors or the rows of the matrix\n * are orthogonal (zero inner
products). Normalization means that each\n * vector or each row of the matrix has an L2 norm that equals `1`.\n
*\n * @doc {heading:'Operations', subheading:'Linear Algebra', namespace:'linalg'}\n */\nfunction
gramSchmidt_(xs: Tensor1D[]|Tensor2D): Tensor1D[]|Tensor2D {\n let inputIsTensor2D: boolean;\n if
(Array.isArray(xs)) {\n inputIsTensor2D = false;\n assert(\n xs != null && xs.length > 0,\n () => 'Gram-
Schmidt process: input must not be null, undefined, or '\n 'empty');\n const dim = xs[0].shape[0];\n for
(let i = 1; i < xs.length; ++i) {\n assert(\n xs[i].shape[0] === dim,\n () =>\n 'Gram-Schmidt:
Non-unique lengths found in the input vectors: '\n `(${xs as Tensor1D[]}[i].shape[0]) vs. ${dim}`);\n
}\n } else {\n inputIsTensor2D = true;\n xs = split(xs, xs.shape[0], 0).map(x => squeeze(x, [0]));\n }\n\n
assert(\n xs.length <= xs[0].shape[0],\n () => `Gram-Schmidt: Number of vectors (${xs as
Tensor1D[]}.length) exceeds ` +\n `number of dimensions (${xs as Tensor1D[]}[0].shape[0]).`);\n\n const
ys: Tensor1D[] = [];\n const xs1d = xs;\n for (let i = 0; i < xs.length; ++i) {\n ys.push(ENGINE.tidy(() => {\n
let x = xs1d[i];\n if (i > 0) {\n for (let j = 0; j < i; ++j) {\n const proj = mul(sum(mul(ys[j], x)), ys[j]);\n
x = sub(x, proj);\n }\n }\n return div(x, norm(x, 'euclidean'));\n }));\n }\n\n if (inputIsTensor2D)
{\n return stack(ys, 0) as Tensor2D;\n } else {\n return ys;\n }\n}\n\nexport const gramSchmidt =
op({gramSchmidt_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\nimport {ENGINE} from '../engine';\nimport {dispose} from '../globals';\nimport {Tensor, Tensor2D} from
'../tensor';\nimport {assert} from '../util';\nimport {clone} from '../clone';\nimport {concat} from
'../concat';\nimport {div} from '../div';\nimport {eye} from '../eye';\nimport {greater} from '../greater';\nimport
{matMul} from '../mat_mul';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {norm} from
'../norm';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\nimport {slice} from
'../slice';\nimport {stack} from '../stack';\nimport {sub} from '../sub';\nimport {tensor2d} from '../tensor2d';\nimport
{transpose} from '../transpose';\nimport {unstack} from '../unstack';\nimport {where} from '../where';\n\n/**\n *
Compute QR decomposition of m-by-n matrix using Householder transformation.\n * \n * Implementation based
on\n * [http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf]\n *
(http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf)\n * \n * ``js\n * const a = tf.tensor2d([[1, 2], [3,
4]]);\n * let [q, r] = tf.linalg.qr(a);\n * console.log('Q');\n * q.print();\n * console.log('R');\n * r.print();\n *
console.log('Orthogonalized');\n * q.dot(q.transpose()).print() // should be nearly the identity matrix.\n *
console.log('Reconstructed');\n * q.dot(r).print(); // should be nearly [[1, 2], [3, 4]];\n * ``\n * \n * @param x The
`tf.Tensor` to be QR-decomposed. Must have rank >= 2. Suppose\n * it has the shape `[..., M, N]`.\n * @param
fullMatrices An optional boolean parameter. Defaults to `false`.\n * If `true`, compute full-sized `Q`. If `false` (the
default),\n * compute only the leading N columns of `Q` and `R`.\n * @returns An `Array` of two `tf.Tensor`s: `[Q,
R]`. `Q` is a unitary matrix,\n * i.e., its columns all have unit norm and are mutually orthogonal.\n * If `M >=
N`,\n * If `fullMatrices` is `false` (default),\n * - `Q` has a shape of `[..., M, N]`,\n * - `R` has a shape of
`[..., N, N]`.\n * If `fullMatrices` is `true` (default),\n * - `Q` has a shape of `[..., M, M]`,\n * - `R` has a

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shape of `[..., M, N]`.n * If `M < N`,n * - `Q` has a shape of `[..., M, M]`,n * - `R` has a shape of `[..., M,
N]`.n * @throws If the rank of `x` is less than 2.n *n * @doc {heading:'Operations',n * subheading:'Linear
Algebra',n * namespace:'linalg'}n * ^\nfunction qr_(x: Tensor, fullMatrices = false): [Tensor, Tensor] {n
assert(n x.rank >= 2,n () => `qr() requires input tensor to have a rank >= 2, but got rank ${n
x.rank}`);n\n if (x.rank === 2) {n return qr2d(x as Tensor2D, fullMatrices);n } else {n // Rank > 2.n //
TODO(cais): Below we split the input into individual 2D tensors,n // perform QR decomposition on them and
then stack the results backn // together. We should explore whether this can be parallelized.n const
outerDimsProd = x.shape.slice(0, x.shape.length - 2)n .reduce((value, prev) => value * prev);n
const x2ds = unstack(n reshape(n x,n [n outerDimsProd, x.shape[x.shape.length - 2],n
x.shape[x.shape.length - 1]n]),n 0);n const q2ds: Tensor2D[] = [];n const r2ds: Tensor2D[]
= [];n x2ds.forEach(x2d => {n const [q2d, r2d] = qr2d(x2d as Tensor2D, fullMatrices);n
q2ds.push(q2d);n r2ds.push(r2d);n });n const q = reshape(stack(q2ds, 0), x.shape);n const r =
reshape(stack(r2ds, 0), x.shape);n return [q, r];n }n}\n\nfunction qr2d(x: Tensor2D, fullMatrices = false):
[Tensor2D, Tensor2D] {n return ENGINE.tidy(() => {n assert(n x.shape.length === 2,n () => `qr2d()
requires a 2D Tensor, but got a ${n x.shape.length}D Tensor.`);n\n const m = x.shape[0];n const n =
x.shape[1];n\n let q = eye(m); // Orthogonal transform so far.n let r = clone(x); // Transformed matrix so
far.n\n const one2D = tensor2d([[1]], [1, 1]);n let w: Tensor2D = clone(one2D);n\n const iters = m >= n ? n :
m;n for (let j = 0; j < iters; ++j) {n // This tidy within the for-loop ensures we clean up temporaryn //
tensors as soon as they are no longer needed.n const rTemp = r;n const wTemp = w;n const qTemp = q;n
[w, r, q] = ENGINE.tidy(): [Tensor2D, Tensor2D, Tensor2D] => {n // Find H = I - tau * w * w', to put zeros
below R(j, j).n const rjEnd1 = slice(r, [j, j], [m - j, 1]);n const normX = norm(rjEnd1);n const rjj =
slice(r, [j, j], [1, 1]);n\n // The sign() function returns 0 on 0, which causes division by zero.n const s =
where(greater(rjj, 0), tensor2d([[1]]), tensor2d([[1]]));n\n const u1 = sub(rjj, mul(s, normX));n const wPre
= div(rjEnd1, u1);n if (wPre.shape[0] === 1) {n w = clone(one2D);n } else {n w = concat(n
[n one2D,n slice(wPre, [1, 0], [wPre.shape[0] - 1, wPre.shape[1]])] as\n
Tensor2D\n],n 0);n }n const tau = neg(div(matMul(s, u1), normX)) as Tensor2D;n\n
// -- R := HR, Q := QH.n const rjEndAll = slice(r, [j, 0], [m - j, n]);n const tauTimesW: Tensor2D =
mul(tau, w);n const wT: Tensor2D = transpose(w);n if (j === 0) {n r = sub(rjEndAll,
matMul(tauTimesW, matMul(wT, rjEndAll));n } else {n const rTimesTau: Tensor2D =\n
sub(rjEndAll, matMul(tauTimesW, matMul(wT, rjEndAll));n r = concat([slice(r, [0, 0], [j, n]), rTimesTau],
0);n }n const tauTimesWT: Tensor2D = transpose(tauTimesW);n const qAllJEnd = slice(q, [0, j],
[m, q.shape[1] - j]);n if (j === 0) {n q = sub(qAllJEnd, matMul(matMul(qAllJEnd, w), tauTimesWT));n
} else {n const qTimesTau: Tensor2D =\n sub(qAllJEnd, matMul(matMul(qAllJEnd, w),
tauTimesWT));n q = concat([slice(q, [0, 0], [m, j]), qTimesTau], 1);n }n return [w, r, q];n });n
dispose([rTemp, wTemp, qTemp]);n }n\n if (!fullMatrices && m > n) {n q = slice(q, [0, 0], [m, n]);n r
= slice(r, [0, 0], [n, n]);n }n\n return [q, r];n }) as [Tensor2D, Tensor2D];n}\n\nexport const qr =
op({qr_});n"},"**n * @licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed under the
Apache License, Version 2.0 (the \"License\");n * you may not use this file except in compliance with the
License.n * You may obtain a copy of the License atn *n * http://www.apache.org/licenses/LICENSE-2.0n *n *
Unless required by applicable law or agreed to in writing, softwaren * distributed under the License is distributed
on an \"AS IS\" BASIS,n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.n * See the License for the specific language governing permissions andn * limitations under the
License.n *
=====n
*\n\nexport enum Reduction {n NONE,n MEAN,n SUM,n SUM_BY_NONZERO_WEIGHTS\n}\n"},"**n *
@licensen * Copyright 2020 Google LLC. All Rights Reserved.n * Licensed under the Apache License, Version
2.0 (the \"License\");n * you may not use this file except in compliance with the License.n * You may obtain a
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law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

```
=====\n*\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n{TensorLike} from '../types';\nimport {cast} from './cast';\nimport {div} from './div';\nimport {Reduction} from\n../loss_ops_utils';\nimport {mean} from './mean';\nimport {mul} from './mul';\nimport {notEqual} from\n../not_equal';\nimport {ones} from './ones';\nimport {op} from './operation';\nimport {scalar} from\n../scalar';\nimport {sum} from './sum';\n\n/**\n * Computes the weighted loss between two tensors.\n *\n * @param losses Tensor of shape `[batch_size, d1, ... dN]`.\n * @param weights Tensor whose rank is either 0, or the\n * same rank as\n * `losses`, and must be broadcastable to `losses` (i.e., all\n * dimensions must be either `1`, or the\n * same as the corresponding\n * `losses` dimension).\n *\n * @doc {heading: 'Training', subheading: 'Losses',\n * namespace: 'losses'}\n *\nfunction computeWeightedLoss_<T extends Tensor, O extends Tensor>(\n losses:\n T|TensorLike, weights?: Tensor|TensorLike,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $losses = convertToTensor(losses, 'losses', 'computeWeightedLoss');\n let $weights: Tensor = null;\n if\n (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'computeWeightedLoss');\n }\n\n const\n weightedLoss = ($weights == null) ? $losses : mul($losses, $weights);\n\n if (reduction === Reduction.NONE) {\n return weightedLoss as O;\n }\n if (reduction === Reduction.SUM) {\n return sum(weightedLoss);\n }\n if\n (reduction === Reduction.MEAN) {\n if ($weights == null) {\n return mean(weightedLoss);\n }\n }\n\n const broadcastFactor = $losses.size / $weights.size;\n const result = div(sum(weightedLoss), sum($weights));\n\n return broadcastFactor > 1 ? div(result, scalar(broadcastFactor)) :\n result as O;\n }\n }\n\n (reduction === Reduction.SUM_BY_NONZERO_WEIGHTS) {\n if ($weights == null) {\n return\n div(sum(weightedLoss), scalar($losses.size));\n }\n }\n\n const broadcastedWeights = mul($weights,\n ones($losses.shape));\n\n const numNonZeros =\n cast(sum(notEqual(broadcastedWeights, scalar(0))),\n 'float32');\n\n return div(sum(weightedLoss), numNonZeros);\n }\n }\n\n throw Error(`Unknown reduction:\n ${reduction}`);\n }\n\nexport const computeWeightedLoss = op({computeWeightedLoss_});\n\n/**\n * @license\n *\n * Copyright 2020 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n *\n * you may not use this file except in compliance with the License.\n *\n * You may obtain a copy of the\n * License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n
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=====\n*\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {abs} from './abs';\nimport\n{Reduction} from '../loss_ops_utils';\nimport {op} from './operation';\nimport {sub} from './sub';\n\nimport\n{computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the absolute difference loss\n * between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n * 'predictions'.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or\n * the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or\n * the same as the corresponding\n * `losses`\n * dimension).\n *\n * @param reduction Type of reduction to apply to loss.\n * Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n *\nfunction absoluteDifference_<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike, predictions:\n T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels', 'absoluteDifference');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'absoluteDifference');\n let $weights: Tensor = null;\n if (weights !=\n null) {\n $weights = convertToTensor(weights, 'weights', 'absoluteDifference');\n }\n\n assertShapesMatch(\n $labels.shape, $predictions.shape, 'Error in absoluteDifference:');\n\n const losses = abs(sub($labels,
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$predictions));\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const absoluteDifference\n = op({absoluteDifference_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n {TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from\n '../loss_ops_utils';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {scalar} from\n './scalar';\nimport {sub} from './sub';\nimport {sum} from './sum';\nimport {computeWeightedLoss} from\n './compute_weighted_loss';\n\n/**\n * Computes the cosine distance loss between two tensors.\n * @param labels The ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions The predicted\n * outputs.\n * @param axis The dimension along which the cosine distance is computed.\n * @param weights Tensor\n * whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param reduction Type of\n * reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc {heading: 'Training', subheading:\n * 'Losses', namespace: 'losses'}\n\nfunction cosineDistance<T extends Tensor, O extends Tensor>(\n labels:\n T|TensorLike, predictions: T|TensorLike, axis: number,\n weights?: Tensor|TensorLike,\n reduction =\n Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',\n 'cosineDistance');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'cosineDistance');\n let\n $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights',\n 'cosineDistance');\n }\n assertShapesMatch(\n $labels.shape, $predictions.shape, 'Error in cosineDistance: ');\n const one = scalar(1);\n const losses = sub(one, sum(mul($labels, $predictions), axis, true));\n return\n computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const cosineDistance =\n op({cosineDistance_});\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *
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=====\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport\n {TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from\n '../loss_ops_utils';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {relu} from\n './relu';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\nimport {computeWeightedLoss} from\n './compute_weighted_loss';\n\n/**\n * Computes the Hinge loss between two tensors.\n * @param labels The\n * ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions The predicted outputs.\n * @param weights Tensor\n * whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to\n * `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param reduction Type of\n * reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc {heading:\n * 'Training', subheading: 'Losses', namespace: 'losses'}\n\nfunction hingeLoss<T extends Tensor, O extends\n Tensor>(\n labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction =\n Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $labels = convertToTensor(labels, 'labels', 'hingeLoss');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'hingeLoss');\n let $weights: Tensor = null;\n if
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(weights != null) {\n $weights = convertToTensor(weights, 'weights', 'hingeLoss');\n }\n
assertShapesMatch($labels.shape, $predictions.shape, 'Error in hingeLoss: ');\n\n const one = scalar(1);\n //
Convert binary labels to (-1, 1)\n $labels = sub(mul(scalar(2), $labels), one);\n const losses = relu(sub(one,
mul($labels, $predictions));\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const
hingeLoss = op({hingeLoss_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {abs} from './abs';\nimport
{add} from './add';\nimport {Reduction} from './loss_ops_utils';\nimport {minimum} from './minimum';\nimport
{mul} from './mul';\nimport {op} from './operation';\nimport {scalar} from './scalar';\nimport {square} from
 './square';\nimport {sub} from './sub';\n\nimport {computeWeightedLoss} from
 './compute_weighted_loss';\n\n/**\n * Computes the huber loss between two tensors.\n *\n * @param labels The
ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions The predicted outputs.\n
*\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to
`labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n
*\n * @param delta Point where huber loss changes from quadratic to linear.\n * @param reduction Type of reduction to
apply to loss. Should be of type\n * `Reduction`.\n *\n * @doc {heading: 'Training', subheading: 'Losses',
namespace: 'losses'}\n *\nfunction huberLoss<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike,\n
predictions: T|TensorLike,\n weights?: Tensor|TensorLike, delta = 1.0,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',
'huberLoss');\n const $predictions = convertToTensor(predictions, 'predictions', 'huberLoss');\n let $weights:
Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'huberLoss');\n }\n\n
assertShapesMatch($labels.shape, $predictions.shape, 'Error in huberLoss: ');\n\n const deltaScalar =
scalar(delta);\n const error = abs(sub($predictions, $labels));\n const quadratic = minimum(error, deltaScalar);\n
const linear = sub(error, quadratic);\n\n const losses =\n add(mul(scalar(0.5), square(quadratic)),\n mul(deltaScalar, linear));\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const huberLoss
= op({huberLoss_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
under the License.\n *
=====
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {add} from './add';\nimport
{log} from './log';\nimport {Reduction} from './loss_ops_utils';\nimport {mul} from './mul';\nimport {neg} from
 './neg';\nimport {op} from './operation';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\nimport
{computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the log loss between two tensors.\n
*\n * @param labels The ground truth output tensor, same dimensions as\n * `predictions`.\n * @param predictions
The predicted outputs.\n *\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and
must be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding

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`losses`\n * dimension).\n * @param epsilon A small increment to avoid taking log of zero\n * @param reduction
Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training',
subheading: 'Losses', namespace: 'losses'}\n *\nfunction logLoss_<T extends Tensor, O extends Tensor>(\n
labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike, epsilon = 1e-7,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels', 'logLoss');\n
const $predictions = convertToTensor(predictions, 'predictions', 'logLoss');\n let $weights: Tensor = null;\n if
(weights != null) {\n $weights = convertToTensor(weights, 'weights', 'logLoss');\n }\n
assertShapesMatch($labels.shape, $predictions.shape, 'Error in logLoss: ');\n\n const one = scalar(1);\n const
epsilonScalar = scalar(epsilon);\n\n const l1 = neg(mul($labels, log(add($predictions, epsilonScalar))));\n const l2
=\n mul(sub(one, $labels), log(add(sub(one, $predictions), epsilonScalar)));\n const losses = sub(l1, l2);\n return
computeWeightedLoss(losses, $weights, reduction);\n}\nexport const logLoss = op({logLoss_});\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {Reduction} from
../loss_ops_utils';\nimport {op} from '../operation';\nimport {squaredDifference} from
../squared_difference';\n\nimport {computeWeightedLoss} from '../compute_weighted_loss';\n\n/**\n * Computes
the mean squared error between two tensors.\n *\n * @param labels The ground truth output tensor, same
dimensions as\n * `predictions`.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose
rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *
must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param reduction Type of
reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training', subheading:
'Losses', namespace: 'losses'}\n *\nfunction meanSquaredError_<T extends Tensor, O extends Tensor>(\n labels:
T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',
'meanSquaredError');\n const $predictions =\n convertToTensor(predictions, 'predictions',
'meanSquaredError');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights =
convertToTensor(weights, 'weights', 'meanSquaredError');\n }\n assertShapesMatch(\n $labels.shape,
$predictions.shape, 'Error in meanSquaredError: ');\n\n const losses = squaredDifference($labels, $predictions);\n
return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const meanSquaredError =
op({meanSquaredError_});\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport {assertShapesMatch} from '../util';\nimport {abs} from '../abs';\nimport
{add} from '../add';\nimport {exp} from '../exp';\nimport {log1p} from '../log1p';\nimport {Reduction} from
../loss_ops_utils';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {op} from
../operation';\nimport {relu} from '../relu';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\n\nimport

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{computeWeightedLoss} from './compute_weighted_loss';\n\nfunction sigmoidCrossEntropyWithLogits_<T
extends Tensor, O extends Tensor>(\n labels: T|TensorLike, logits: T|TensorLike): O {\n const $labels =\n convertToTensor(labels, 'labels', 'sigmoidCrossEntropyWithLogits');\n const $logits =\n convertToTensor(logits,
'logits', 'sigmoidCrossEntropyWithLogits');\n assertShapesMatch(\n $labels.shape, $logits.shape, 'Error in
sigmoidCrossEntropyWithLogits: '); \n\n /**\n * Implementation Details:\n * For brevity, let `x = logits`, `z
= labels`. The logistic loss is\n * $z * -\log(\text{sigmoid}(x)) + (1 - z) * -\log(1 - \text{sigmoid}(x))$ \n * $= z * -\log(1 / (1 + \exp(-x))) + (1 - z) * -\log(\exp(-x) / (1 + \exp(-x)))$ \n * $= z * \log(1 + \exp(-x)) + (1 - z) * (-\log(\exp(-x)) + \log(1 + \exp(-x)))$ \n * $= z * \log(1 + \exp(-x)) + (1 - z) * (x + \log(1 + \exp(-x)))$ \n * $= (1 - z) * x + \log(1 + \exp(-x))$ \n * $= x - x * z + \log(1 + \exp(-x))$ \n * For $x < 0$, to avoid overflow in $\exp(-x)$, we reformulate the above\n * $x - x * z + \log(1 + \exp(-x))$ \n * $= \log(\exp(x)) - x * z + \log(1 + \exp(-x))$ \n * $= -x * z + \log(1 + \exp(x))$ \n * Hence, to ensure stability and avoid overflow, the implementation uses\n * this equivalent formulation:\n * $\max(x, 0) - x * z + \log(1 + \exp(-\text{abs}(x)))$ \n */\n const maxOutput = relu($logits);\n const outputXTarget =
mul($logits, $labels);\n const sigmoidOutput = log1p(exp(neg(abs($logits))));\n\n return add(sub(maxOutput,
outputXTarget), sigmoidOutput);\n}\n\n/**\n * Computes the sigmoid cross entropy loss between two tensors.\n * If labelSmoothing is nonzero, smooth the labels towards 1/2.\n * newMulticlassLabels = multiclassLabels *
(1 - labelSmoothing)\n * + 0.5 * labelSmoothing\n * @param multiClassLabels The ground truth
output tensor of shape\n * [batch_size, num_classes], same dimensions as 'predictions'.\n * @param logits The
predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must
be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n *
dimension).\n * @param labelSmoothing If greater than 0, then smooth the labels.\n * @param reduction Type
of reduction to apply to loss. Should be of type\n * `Reduction`\n * @doc { heading: 'Training', subheading:
'Losses', namespace: 'losses' }\n */\nfunction sigmoidCrossEntropy_<T extends Tensor, O extends Tensor>(\n
multiClassLabels: T|TensorLike, logits: T|TensorLike,\n weights?: Tensor|TensorLike, labelSmoothing = 0,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $multiClassLabels = convertToTensor(\n
multiClassLabels, 'multiClassLabels', 'sigmoidCrossEntropy');\n const $logits = convertToTensor(logits, 'logits',
'sigmoidCrossEntropy');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights =
convertToTensor(weights, 'weights', 'sigmoidCrossEntropy');\n }\n assertShapesMatch(\n
$multiClassLabels.shape, $logits.shape, 'Error in sigmoidCrossEntropy: '); \n\n if (labelSmoothing > 0) {\n const
labelSmoothingScalar = scalar(labelSmoothing);\n const one = scalar(1);\n const half = scalar(0.5);\n\n $multiClassLabels =\n add(mul($multiClassLabels, sub(one, labelSmoothingScalar)),\n mul(half,
labelSmoothingScalar));\n }\n const losses = sigmoidCrossEntropyWithLogits_($multiClassLabels, $logits);\n\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const sigmoidCrossEntropy =
op({sigmoidCrossEntropy_});\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n\n * \nimport {customGrad} from './../gradients';\nimport {Tensor} from './../tensor';\nimport {GradSaveFunc} from
'./../tensor_types';\nimport {convertToTensor} from './../tensor_util_env';\nimport {TensorLike} from
'./../types';\nimport {assertShapesMatch} from './../util';\nimport {add} from './add';\nimport
{expandShapeToKeepDim} from './axis_util';\nimport {cast} from './cast';\nimport {div} from './div';\nimport
{exp} from './exp';\nimport {logSumExp} from './log_sum_exp';\nimport {Reduction} from
'./loss_ops_utils';\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {op} from
'./operation';\nimport {reshape} from './reshape';\nimport {scalar} from './scalar';\nimport {sub} from
'./sub';\nimport {sum} from './sum';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n

```



```

* Computes softmax cross entropy between logits and labels.
* Measures the probability error in discrete
classification tasks in which
* the classes are mutually exclusive (each entry is in exactly one class).
* For
example, each CIFAR-10 image is labeled with one and only one label: an
* image can be a dog or a truck, but not
both.
* `NOTE` : While the classes are mutually exclusive, their probabilities need
* not be. All that is
required is that each row of labels is a valid
* probability distribution. If they are not, the computation of the
gradient
* will be incorrect.
* `WARNING` : This op expects unscaled logits, since it performs a softmax
on
* logits internally for efficiency. Do not call this op with the output of
* softmax, as it will produce incorrect
results.
* logits and labels must have the same shape, e.g. [batch_size, num_classes]
* and the same dtype.
* @param labels The labels array.
* @param logits The logits array.
* @param dim The dimension softmax
would be performed on. Defaults to -1
* which indicates the last dimension.
*/
function
softmaxCrossEntropyWithLogits_<T extends Tensor, O extends Tensor>(
 labels: T, logits: T, dim = -1): O {
 if (dim === -1) {
 dim = logits.rank - 1;
 }
 if (dim !== logits.rank - 1) {
 throw Error(
 `Softmax
cross entropy along a non-last dimension is not yet
+ supported. Labels / logits was rank ${logits.rank}
+ and dim was ${dim}`);
 }
 // Use a custom gradient for numerical stability.
 const customOp =
customGrad((labels: Tensor, logits: Tensor, save: GradSaveFunc) => {
 // Reference:
 // 1.
http://cs231n.github.io/linear-classify/#softmax
 // 2. https://blog.feedly.com/tricks-of-the-trade-logsumexp/
 const keepDims = true;
 const lse = logSumExp(logits, [dim], keepDims);
 const logResult =
sub(cast(logits, 'float32'), lse);
 save([labels, logResult]);
 const costVector = neg(mul(logResult,
labels));
 const value: O = sum(costVector, [dim]);
 const gradFunc = (dy: O, saved: Tensor[]) => {
 const [labels, logResult] = saved;
 const dyShape = expandShapeToKeepDim(dy.shape, [dim]);
 return [
 mul(reshape(dy, dyShape),
 sub(cast(labels, 'float32'), exp(logResult))),
 mul(reshape(dy, dyShape),
 sub(exp(logResult), cast(labels, 'float32'))),
];
 };
 return
{ value, gradFunc };
});
 return customOp(labels, logits);
}

/**
 * Computes the softmax cross entropy
loss between two tensors.
 * If labelSmoothing is nonzero, smooth the labels towards 1/2.
 *
newOnehotLabels = onehotLabels * (1 - labelSmoothing)
+ labelSmoothing / numClasses
 * @param onehotLabels One hot encoded labels
[batch_size, num_classes], same dimensions as 'predictions'.
 * @param logits The predicted outputs.
 * @param weights Tensor whose rank is either 0, or 1, and must be
broadcastable to `loss` of shape [batch_size]
 * @param labelSmoothing If greater than 0, then smooth the
labels.
 * @param reduction Type of reduction to apply to loss. Should be of type
`Reduction`
 * @doc
{ heading: 'Training', subheading: 'Losses', namespace: 'losses' }
*/
function softmaxCrossEntropy_<T extends
Tensor, O extends Tensor>(
 onehotLabels: T|TensorLike, logits: T|TensorLike,
 weights?:
Tensor|TensorLike, labelSmoothing = 0,
 reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {
 let
$onehotLabels =
convertToTensor(onehotLabels, 'onehotLabels', 'softmaxCrossEntropy');
 const $logits =
convertToTensor(logits, 'logits', 'softmaxCrossEntropy');
 let $weights: Tensor = null;
 if (weights !== null) {
 $weights = convertToTensor(weights, 'weights', 'softmaxCrossEntropy');
 }
 assertShapesMatch(
$onehotLabels.shape, $logits.shape, 'Error in softmaxCrossEntropy: ');
 if (labelSmoothing > 0) {
 const
labelSmoothingScalar = scalar(labelSmoothing);
 const one = scalar(1);
 const numClasses =
scalar($onehotLabels.shape[1]);
 $onehotLabels =
add(mul($onehotLabels, sub(one,
labelSmoothingScalar)),
div(labelSmoothingScalar, numClasses));
 }
 const losses =
softmaxCrossEntropyWithLogits_($onehotLabels, $logits);
 return computeWeightedLoss(losses, $weights,
reduction);
}

export const softmaxCrossEntropy = op({ softmaxCrossEntropy_ });
/**
 * @license
 * Copyright 2020 Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the
`License`);
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the
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 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or
agreed to in writing, software
 * distributed under the License is distributed on an `AS IS` BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for
the specific language governing permissions and
 * limitations under the License.
 */
=====

```

\*\n\n// Modularized ops.\nexport {abs} from './abs';\nexport {acos} from './acos';\nexport {acosh} from './acosh';\nexport {add} from './add';\nexport {addN} from './add\_n';\nexport {all} from './all';\nexport {any} from './any';\nexport {argMax} from './arg\_max';\nexport {argMin} from './arg\_min';\nexport {asin} from './asin';\nexport {asinh} from './asinh';\nexport {atan} from './atan';\nexport {atan2} from './atan2';\nexport {atanh} from './atanh';\nexport {avgPool} from './avg\_pool';\nexport {avgPool3d} from './avg\_pool\_3d';\nexport {basicLSTMCell} from './basic\_lstm\_cell';\nexport {batchToSpaceND} from './batch\_to\_space\_nd';\nexport {batchNorm} from './batchnorm';\nexport {batchNorm2d} from './batchnorm2d';\nexport {batchNorm3d} from './batchnorm3d';\nexport {batchNorm4d} from './batchnorm4d';\nexport {bincount} from './bincount';\nexport {broadcastTo} from './broadcast\_to';\nexport {buffer} from './buffer';\nexport {cast} from './cast';\nexport {ceil} from './ceil';\nexport {clipByValue} from './clip\_by\_value';\nexport {clone} from './clone';\nexport {complex} from './complex';\nexport {concat} from './concat';\nexport {concat1d} from './concat\_1d';\nexport {concat2d} from './concat\_2d';\nexport {concat3d} from './concat\_3d';\nexport {concat4d} from './concat\_4d';\nexport {conv1d} from './conv1d';\nexport {conv2d} from './conv2d';\nexport {conv2dTranspose} from './conv2d\_transpose';\nexport {conv3d} from './conv3d';\nexport {conv3dTranspose} from './conv3d\_transpose';\nexport {cos} from './cos';\nexport {cosh} from './cosh';\nexport {cumsum} from './cumsum';\nexport {denseBincount} from './dense\_bincount';\nexport {depthToSpace} from './depth\_to\_space';\nexport {depthwiseConv2d} from './depthwise\_conv2d';\nexport {diag} from './diag';\nexport {dilation2d} from './dilation2d';\nexport {div} from './div';\nexport {divNoNaN} from './div\_no\_nan';\nexport {dot} from './dot';\nexport {elu} from './elu';\nexport {equal} from './equal';\nexport {erf} from './erf';\nexport {exp} from './exp';\nexport {expandDims} from './expand\_dims';\nexport {expm1} from './expm1';\nexport {eye} from './eye';\nexport {fill} from './fill';\nexport {floor} from './floor';\nexport {floorDiv} from './floorDiv';\nexport {gather} from './gather';\nexport {greater} from './greater';\nexport {greaterEqual} from './greater\_equal';\nexport {imag} from './imag';\nexport {isFinite} from './is\_finite';\nexport {isInf} from './is\_inf';\nexport {isNaN} from './is\_nan';\nexport {leakyRelu} from './leaky\_relu';\nexport {less} from './less';\nexport {lessEqual} from './less\_equal';\nexport {linspace} from './linspace';\nexport {localResponseNormalization} from './local\_response\_normalization';\nexport {log} from './log';\nexport {log1p} from './log1p';\nexport {logSigmoid} from './log\_sigmoid';\nexport {logSoftmax} from './log\_softmax';\nexport {logSumExp} from './log\_sum\_exp';\nexport {logicalAnd} from './logical\_and';\nexport {logicalNot} from './logical\_not';\nexport {logicalOr} from './logical\_or';\nexport {logicalXor} from './logical\_xor';\nexport {matMul} from './mat\_mul';\nexport {max} from './max';\nexport {maxPool} from './max\_pool';\nexport {maxPool3d} from './max\_pool\_3d';\nexport {maxPoolWithArgmax} from './max\_pool\_with\_argmax';\nexport {maximum} from './maximum';\nexport {mean} from './mean';\nexport {min} from './min';\nexport {minimum} from './minimum';\nexport {mirrorPad} from './mirror\_pad';\nexport {mod} from './mod';\nexport {moments} from './moments';\nexport {mul} from './mul';\nexport {LSTMCellFunc, multiRNNCell} from './multi\_rnn\_cell';\nexport {multinomial} from './multinomial';\nexport {neg} from './neg';\nexport {notEqual} from './not\_equal';\nexport {oneHot} from './one\_hot';\nexport {ones} from './ones';\nexport {onesLike} from './ones\_like';\nexport {outerProduct} from './outer\_product';\nexport {pad} from './pad';\nexport {pad1d} from './pad1d';\nexport {pad2d} from './pad2d';\nexport {pad3d} from './pad3d';\nexport {pad4d} from './pad4d';\nexport {pool} from './pool';\nexport {pow} from './pow';\nexport {prelu} from './prelu';\nexport {print} from './print';\nexport {prod} from './prod';\nexport {rand} from './rand';\nexport {randomGamma} from './random\_gamma';\nexport {randomNormal} from './random\_normal';\nexport {randomUniform} from './random\_uniform';\nexport {range} from './range';\nexport {real} from './real';\nexport {reciprocal} from './reciprocal';\nexport {relu} from './relu';\nexport {relu6} from './relu6';\nexport {reshape} from './reshape';\nexport {reverse} from './reverse';\nexport {reverse1d} from './reverse\_1d';\nexport {reverse2d} from './reverse\_2d';\nexport {reverse3d} from './reverse\_3d';\nexport {reverse4d} from './reverse\_4d';\nexport {round} from './round';\nexport {rsqrt} from './rsqrt';\nexport {scalar} from './scalar';\nexport {selu} from './selu';\nexport {separableConv2d} from './separable\_conv2d';\nexport {setdiff1dAsync} from './setdiff1d\_async';\nexport {sigmoid} from './sigmoid';\nexport {sign} from './sign';\nexport {sin} from './sin';\nexport {sinh} from './sinh';\nexport {slice} from './slice';\nexport {slice1d} from './slice1d';\nexport {slice2d} from './slice2d';\nexport

```

{slice3d} from './slice3d';\nextport {slice4d} from './slice4d';\nextport {softmax} from './softmax';\nextport {softplus}
from './softplus';\nextport {spaceToBatchND} from './space_to_batch_nd';\nextport {fft} from './spectral/fft';\nextport
{ifft} from './spectral/ifft';\nextport {irfft} from './spectral/irfft';\nextport {rfft} from './spectral/rfft';\nextport {split}
from './split';\nextport {sqrt} from './sqrt';\nextport {square} from './square';\nextport {squaredDifference} from
 './squared_difference';\nextport {squeeze} from './squeeze';\nextport {stack} from './stack';\nextport {step} from
 './step';\nextport {stridedSlice} from './strided_slice';\nextport {sub} from './sub';\nextport {sum} from './sum';\nextport
{tan} from './tan';\nextport {tanh} from './tanh';\nextport {tensor} from './tensor';\nextport {tensor1d} from
 './tensor1d';\nextport {tensor2d} from './tensor2d';\nextport {tensor3d} from './tensor3d';\nextport {tensor4d} from
 './tensor4d';\nextport {tensor5d} from './tensor5d';\nextport {tensor6d} from './tensor6d';\nextport {tile} from
 './tile';\nextport {topk} from './topk';\nextport {truncatedNormal} from './truncated_normal';\nextport {unique} from
 './unique';\nextport {unsortedSegmentSum} from './unsorted_segment_sum';\nextport {unstack} from
 './unstack';\nextport {variable} from './variable';\nextport {where} from './where';\nextport {whereAsync} from
 './where_async';\nextport {zeros} from './zeros';\nextport {zerosLike} from './zeros_like';\n\nnextport * from
 './boolean_mask';\nextport * from './transpose';\nextport * from './norm';\nextport * from './moving_average';\nextport *
from './scatter_nd';\nextport * from './sparse_to_dense';\nextport * from './gather_nd';\nextport * from
 './dropout';\nextport * from './signal_ops_util';\nextport * from './in_top_k';\n\nnextport {op, OP_SCOPE_SUFFIX}
from './operation';\n\nimport {rfft} from './spectral/rfft';\nimport {fft} from './spectral/fft';\nimport {ifft} from
 './spectral/ifft';\nimport {irfft} from './spectral/irfft';\nconst spectral = {\n fft,\n ifft,\n rfft,\n irfft\n};\n\nimport * as
fused from './fused_ops';\n\nimport {hammingWindow} from './signal/hamming_window';\nimport {hannWindow}
from './signal/hann_window';\nimport {frame} from './signal/frame';\nimport {stft} from './signal/stft';\nconst signal
= {\n hammingWindow,\n hannWindow,\n frame,\n stft,\n};\n\n// Image Ops namespace\nimport
{cropAndResize} from './image/crop_and_resize';\nimport {flipLeftRight} from './image/flip_left_right';\nimport
{rotateWithOffset} from './image/rotate_with_offset';\nimport {nonMaxSuppression} from
 './image/non_max_suppression';\nimport {nonMaxSuppressionAsync} from
 './image/non_max_suppression_async';\nimport {nonMaxSuppressionWithScore} from
 './image/non_max_suppression_with_score';\nimport {nonMaxSuppressionWithScoreAsync} from
 './image/non_max_suppression_with_score_async';\nimport {nonMaxSuppressionPadded} from
 './image/non_max_suppression_padded';\nimport {nonMaxSuppressionPaddedAsync} from
 './image/non_max_suppression_padded_async';\nimport {resizeBilinear} from './image/resize_bilinear';\nimport
{resizeNearestNeighbor} from './image/resize_nearest_neighbor';\nconst image = {\n flipLeftRight,\n
resizeNearestNeighbor,\n resizeBilinear,\n rotateWithOffset,\n cropAndResize,\n nonMaxSuppression,\n
nonMaxSuppressionAsync,\n nonMaxSuppressionWithScore,\n nonMaxSuppressionWithScoreAsync,\n
nonMaxSuppressionPadded,\n nonMaxSuppressionPaddedAsync\n};\n\n// linalg namespace\nimport {bandPart}
from './linalg/band_part';\nimport {gramSchmidt} from './linalg/gram_schmidt';\nimport {qr} from
 './linalg/qr';\nconst linalg = {\n bandPart,\n gramSchmidt,\n qr\n};\n\n// losses namespace;\nimport
{absoluteDifference} from './losses/absolute_difference';\nimport {computeWeightedLoss} from
 './losses/compute_weighted_loss';\nimport {cosineDistance} from './losses/cosine_distance';\nimport {hingeLoss}
from './losses/hinge_loss';\nimport {huberLoss} from './losses/huber_loss';\nimport {logLoss} from
 './losses/log_loss';\nimport {meanSquaredError} from './losses/mean_squared_error';\nimport
{sigmoidCrossEntropy} from './losses/sigmoid_cross_entropy';\nimport {softmaxCrossEntropy} from
 './losses/softmax_cross_entropy';\nconst losses = {\n absoluteDifference,\n computeWeightedLoss,\n
cosineDistance,\n hingeLoss,\n huberLoss,\n logLoss,\n meanSquaredError,\n sigmoidCrossEntropy,\n
softmaxCrossEntropy\n};\n\n// Second level exports.\nextport {image, linalg, losses, spectral, fused,
signal};\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the

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```
=====
*/nimport {dispose} from './globals';nimport {variableGrads} from './gradients';nimport {scalar} from
 './ops/ops';nimport {Serializable} from './serialization';nimport {Scalar, Variable} from './tensor';nimport
 {NamedTensor, NamedTensorMap} from './tensor_types';n/n/**n * A variable that belongs to an optimizer.n *n
 * The `originalName` field is required for keeping track of the canonicaln * name of the variable, which is usually
 the name of the model weight thatn * the variable is related to plus a suffix, e.g., 'dense1/kernel/momentum'.n *
 The name of the `Variable` object itself cannot be used directly due to\n * possible deduplication: Every `Variable`
 must have a unique name but more\n * than one optimizer objects of the same type may be created for the same
 model\n * or the same `Variable`.n */nexport interface OptimizerVariable {n originalName: string;n variable:
 Variable;n}n/n/** @doc {heading: 'Training', subheading: 'Classes', namespace: 'train'} */nexport abstract class
 Optimizer extends Serializable {n protected iterations_: number;n /**n * Executes `f()` and minimizes the
 scalar output of `f()` by computingn * gradients of y with respect to the list of trainable variables provided by\n
 * `varList`. If no list is provided, it defaults to all trainable variables.n *n * @param f The function to execute and
 whose output to minimize.n * @param returnCost Whether to return the scalar cost value produced by\n *
 executing `f()`.n * @param varList An optional list of variables to update. If specified, only\n * the trainable
 variables in varList will be updated by minimize. Defaults to\n * all trainable variables.n *n * @doc {heading:
 'Training', subheading: 'Optimizers'}n */n minimize(f: () => Scalar, returnCost = false, varList?: Variable[]):
 Scalar\n |null {n const {value, grads} = this.computeGradients(f, varList);n\n if (varList != null) {n
 const gradArray: NamedTensor[] =\n varList.map(v => ({name: v.name, tensor: grads[v.name]}));n
 this.applyGradients(gradArray);n } else {n this.applyGradients(grads);n }n\n // Dispose gradients.n
 dispose(grads);n\n if (returnCost) {n return value;n } else {n value.dispose();n return null;n }n
 }n/n /**n * The number of iterations that this optimizer instance has been invoked for.n */n get iterations():
 number {n if (this.iterations_ == null) {n this.iterations_ = 0;n }n return this.iterations_;n }n\n
 protected incrementIterations() {n this.iterations_ = this.iterations + 1;n }n/n /**n * Executes f() and
 computes the gradient of the scalar output of f() with\n * respect to the list of trainable variables provided by
 `varList`. If no\n * list is provided, it defaults to all trainable variables.n */n * @param f The function to execute
 and whose output to use for computingn * gradients with respect to variables.n * @param varList An optional
 list of variables to compute gradients with\n * respect to. If specified, only the trainable variables in varList will
 have\n * gradients computed with respect to. Defaults to all trainable variables.n */n * @doc {heading:
 'Training', subheading: 'Optimizers'}n */n computeGradients(f: () => Scalar, varList?: Variable[]):\n {value:
 Scalar, grads: NamedTensorMap} {n return variableGrads(f, varList);n }n/n /**n * Updates variables by
 using the computed gradients.n */n * @param variableGradients A mapping of variable name to its gradient
 value.n */n * @doc {heading: 'Training', subheading: 'Optimizers'}n */n abstract
 applyGradients(variableGradients: NamedTensorMap|n NamedTensor[]): void;n/n /**n *
 Dispose the variables (if any) owned by this optimizer instance.n */n dispose(): void {n if (this.iterations_ !=
 null) {n dispose(this.iterations_);n }n }n\n async saveIterations(): Promise<NamedTensor> {n if
 (this.iterations_ == null) {n this.iterations_ = 0;n }n return {n name: 'iter', // Named for Python
 compatibility.n // TODO(cais): Use 'int64' type when available.n tensor: scalar(this.iterations_, 'int32')\n
 };n }n\n async getWeights(): Promise<NamedTensor[]> {n throw new Error('getWeights() is not implemented
 for this optimizer yet.');
```

instance.applyGradients != null;\n }));\n"},"/\*\n \* @license\n \* Copyright 2018 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the "License");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \* http://www.apache.org/licenses/LICENSE-2.0\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an "AS IS" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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*\n\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {add} from './ops/add';\nimport {div} from './ops/div';\nimport {mul} from './ops/mul';\nimport {sqrt} from './ops/ops';\nimport {square} from './ops/square';\nimport {zerosLike} from './ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from './serialization';\nimport {NamedTensor, NamedVariableMap} from './tensor_types';\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\nexport class AdadeltaOptimizer extends Optimizer {\n /** @nocollapse */\n static className = 'Adadelta'; // Name matters for Python compatibility.\n private accumulatedGrads: OptimizerVariable[] = [];\n private accumulatedUpdates: OptimizerVariable[] = [];\n constructor(\n protected learningRate: number, protected rho: number,\n protected epsilon: number = null) {\n super();\n if (epsilon == null) {\n this.epsilon = ENGINE.backend.epsilon();\n }\n applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) :\n Object.keys(variableGradients);\n variableNames.forEach((name, i) => {\n const value = ENGINE.registeredVariables[name];\n const trainable = false;\n if (this.accumulatedGrads[i] == null) {\n this.accumulatedGrads[i] = {\n originalName: `${name}/accum_grad`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n };\n }\n if (this.accumulatedUpdates[i] == null) {\n this.accumulatedUpdates[i] = {\n originalName: `${name}/accum_var`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n };\n }\n const gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n if (gradient == null) {\n return;\n }\n const accumulatedGrad = this.accumulatedGrads[i].variable;\n const accumulatedUpdate = this.accumulatedUpdates[i].variable;\n tidy(() => {\n const newAccumulatedGrad =\n add(mul(accumulatedGrad, this.rho),\n mul(square(gradient), 1 - this.rho));\n const updates =\n mul(div(sqrt(add(accumulatedUpdate, this.epsilon)),\n sqrt(add(accumulatedGrad, this.epsilon))),\n gradient);\n const newAccumulatedUpdate =\n add(mul(accumulatedUpdate, this.rho),\n mul(square(updates), 1 - this.rho));\n accumulatedGrad.assign(newAccumulatedGrad);\n accumulatedUpdate.assign(newAccumulatedUpdate);\n const newValue = add(mul(updates, -this.learningRate), value);\n value.assign(newValue);\n });\n });\n this.incrementIterations();\n }\n dispose(): void {\n if (this.accumulatedUpdates != null) {\n dispose(this.accumulatedGrads.map(v => v.variable));\n dispose(this.accumulatedUpdates.map(v => v.variable));\n }\n }\n async getWeights(): Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables: OptimizerVariable[] =\n [...this.accumulatedGrads, ...this.accumulatedUpdates];\n return [await this.saveIterations()].concat(\n variables.map(v => ({name: v.originalName, tensor: v.variable}));\n);\n }\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const variableCount = weightValues.length / 2;\n const trainable = false;\n this.accumulatedGrads =\n weightValues.slice(0, variableCount).map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(\n trainable)\n }));\n this.accumulatedUpdates =\n weightValues.slice(variableCount, variableCount * 2)\n .map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n }\n getConfig(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'rho': this.rho,\n 'epsilon': this.epsilon\n };\n }\n }\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n cls:

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SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config['learningRate'], config['rho'], config['epsilon']);\n }\n}\n\nregisterClass(AdadeltaOptimizer);\n"/\*\*\n \* @license\n \* Copyright 2018 Google LLC. All Rights Reserved.\n \* Licensed under the Apache License, Version 2.0 (the \"License\");\n \* you may not use this file except in compliance with the License.\n \* You may obtain a copy of the License at\n \*\n \* http://www.apache.org/licenses/LICENSE-2.0\n \*\n \* Unless required by applicable law or agreed to in writing, software\n \* distributed under the License is distributed on an \"AS IS\" BASIS,\n \* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n \* See the License for the specific language governing permissions and\n \* limitations under the License.\n \*

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=====\n*\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from '../ops/add';\nimport {div} from '../ops/div';\nimport {fill} from '../ops/fill';\nimport {mul} from '../ops/mul';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from '../ops/square';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\n\nexport class AdagradOptimizer extends Optimizer {\n /** @nocollapse */\n static className = 'Adagrad'; // Note: Name matters for Python compatibility.\n\n private accumulatedGrads: OptimizerVariable[] = [];\n\n constructor(\n protected learningRate: number, private initialAccumulatorValue = 0.1) {\n super();\n }\n\n applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) : Object.keys(variableGradients);\n\n variableNames.forEach((name, i) => {\n const value = ENGINE.registeredVariables[name];\n if (this.accumulatedGrads[i] == null) {\n const trainable = false;\n this.accumulatedGrads[i] = {\n originalName: `${name}/accumulator`,\n variable: tidy(\n () => fill(value.shape, this.initialAccumulatorValue)\n .variable(trainable))\n }; \n }\n\n const gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor : variableGradients[name];\n if (gradient == null) {\n return;\n }\n\n const accumulatedGrad = this.accumulatedGrads[i].variable;\n\n tidy(() => {\n const newAccumulatedGrad = add(accumulatedGrad, square(gradient));\n accumulatedGrad.assign(newAccumulatedGrad);\n\n const newValue = add(\n mul(div(gradient,\n sqrt(add(newAccumulatedGrad, ENGINE.backend.epsilon()))),\n this.learningRate),\n value);\n value.assign(newValue);\n });\n });\n\n this.incrementIterations();\n }\n\n dispose(): void {\n if (this.accumulatedGrads != null) {\n dispose(this.accumulatedGrads.map(v => v.variable));\n }\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n return [await this.saveIterations()].concat(this.accumulatedGrads.map(\n v => ({name: v.originalName, tensor: v.variable}));\n)\n }\n\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const trainable = false;\n this.accumulatedGrads = weightValues.map(\n v => ({originalName: v.name, variable: v.tensor.variable(trainable)});\n)\n }\n\n getConfig(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'initialAccumulatorValue': this.initialAccumulatorValue,\n }; \n }\n\n /** @nocollapse */\n\n static fromConfig<T extends Serializable>(\n cls: SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config['learningRate'], config['initialAccumulatorValue']);\n }\n\n }\n\n\nregisterClass(AdagradOptimizer);\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from
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../ops/add';\nimport {div} from '../ops/div';\nimport {mul} from '../ops/mul';\nimport {pow} from
../ops/pow';\nimport {scalar} from '../ops/scalar';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from
../ops/square';\nimport {sub} from '../ops/sub';\nimport {zerosLike} from '../ops/zeros_like';\nimport {ConfigDict,
registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {Variable} from
../tensor';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\nimport {Optimizer,
OptimizerVariable} from '../optimizer';\n\nexport class AdamOptimizer extends Optimizer {\n /** @nocollapse */\n
static className = 'Adam'; // Note: Name matters for Python compatibility.\n private accBeta1: Variable;\n
private accBeta2: Variable;\n\n private accumulatedFirstMoment: OptimizerVariable[] = [];\n private
accumulatedSecondMoment: OptimizerVariable[] = [];\n\n constructor(\n protected learningRate: number,
protected beta1: number,\n protected beta2: number, protected epsilon: number = null) {\n super();\n tidy()
=> {\n // accB* will be updated by batch.\n this.accBeta1 = scalar(beta1).variable();\n this.accBeta2 =
scalar(beta2).variable();\n });\n\n if (epsilon == null) {\n this.epsilon = ENGINE.backend.epsilon();\n }\n
}\n\n applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n const varNames =
Array.isArray(variableGradients) ?\n variableGradients.map(v => v.name) :\n
Object.keys(variableGradients);\n tidy() => {\n const oneMinusAccBeta1 = sub(1, this.accBeta1);\n const
oneMinusAccBeta2 = sub(1, this.accBeta2);\n\n varNames.forEach((name, i) => {\n const value =
ENGINE.registeredVariables[name];\n const trainable = false;\n if (this.accumulatedFirstMoment[i] ==
null) {\n this.accumulatedFirstMoment[i] = {\n originalName: `${name}/m`,\n variable: tidy()
=> zerosLike(value).variable(trainable))\n };\n }\n if (this.accumulatedSecondMoment[i] == null) {\n
 this.accumulatedSecondMoment[i] = {\n originalName: `${name}/v`,\n variable: tidy() =>
zerosLike(value).variable(trainable))\n };\n }\n\n const gradient = Array.isArray(variableGradients)
?\n variableGradients[i].tensor :\n variableGradients[name];\n if (gradient == null) {\n
return;\n }\n\n const firstMoment = this.accumulatedFirstMoment[i].variable;\n const secondMoment =
this.accumulatedSecondMoment[i].variable;\n\n const newFirstMoment =\n add(mul(firstMoment,
this.beta1), mul(gradient, 1 - this.beta1));\n const newSecondMoment =\n add(mul(secondMoment,
this.beta2),\n mul(square(gradient), 1 - this.beta2));\n\n const biasCorrectedFirstMoment =
div(newFirstMoment, oneMinusAccBeta1);\n const biasCorrectedSecondMoment =\n div(newSecondMoment,
oneMinusAccBeta2);\n\n firstMoment.assign(newFirstMoment);\n secondMoment.assign(newSecondMoment);\n\n
 const newValue =\n add(mul(div(biasCorrectedFirstMoment,\n add(sqrt(biasCorrectedSecondMoment), this.epsilon)),\n
 -this.learningRate),\n value);\n value.assign(newValue);\n });\n\n this.accBeta1.assign(mul(this.accBeta1, this.beta1));\n this.accBeta2.assign(mul(this.accBeta2, this.beta2));\n
 });\n this.incrementIterations();\n }\n\n dispose(): void {\n this.accBeta1.dispose();\n this.accBeta2.dispose();\n if (this.accumulatedFirstMoment != null) {\n
dispose(this.accumulatedFirstMoment.map(v => v.variable));\n }\n if (this.accumulatedSecondMoment != null)
{\n dispose(this.accumulatedSecondMoment.map(v => v.variable));\n }\n }\n\n async getWeights():
Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables: OptimizerVariable[]
=\n [...this.accumulatedFirstMoment, ...this.accumulatedSecondMoment];\n return [await
this.saveIterations()].concat(\n variables.map(v => ({name: v.originalName, tensor: v.variable}));\n);\n }\n\n
async setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await
this.extractIterations(weightValues);\n tidy() => {\n this.accBeta1.assign(pow(this.beta1, this.iterations_ +
1));\n this.accBeta2.assign(pow(this.beta2, this.iterations_ + 1));\n });\n\n const variableCount =
weightValues.length / 2;\n const trainable = false;\n this.accumulatedFirstMoment =\n weightValues.slice(0,
variableCount).map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(\n
trainable)\n }));\n this.accumulatedSecondMoment =\n weightValues.slice(variableCount, variableCount * 2)\n .map(v =>
({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n }\n\n getConf(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'beta1': this.beta1,\n 'beta2':

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this.beta2,\n 'epsilon': this.epsilon,\n });\n\n /** @nocollapse */\n static fromConfig<T extends\n Serializable>(\n cls: SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(\n config['learningRate'], config['beta1'], config['beta2'],\n config['epsilon']);\n }\n\nregisterClass(AdamaxOptimizer);\n","/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n * =====\n *\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {abs} from\n './ops/abs';\nimport {add} from './ops/add';\nimport {div} from './ops/div';\nimport {maximum} from\n './ops/maximum';\nimport {mul} from './ops/mul';\nimport {scalar} from './ops/scalar';\nimport {sub} from\n './ops/sub';\nimport {zerosLike} from './ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable,\n SerializableConstructor} from './serialization';\nimport {Variable} from './tensor';\nimport {NamedTensor,\n NamedVariableMap} from './tensor_types';\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\nexport\nclass AdamaxOptimizer extends Optimizer {\n /** @nocollapse */\n static className = 'Adamax'; // Note: Name\n matters for Python compatibility.\n private accBeta1: Variable;\n private iteration: Variable;\n private\n accumulatedFirstMoment: OptimizerVariable[] = [];\n private accumulatedWeightedInfNorm: OptimizerVariable[]\n = [];\n constructor(\n protected learningRate: number, protected beta1: number,\n protected beta2: number,\n protected epsilon: number = null,\n protected decay = 0.0) {\n super();\n tidy() => {\n this.iteration =\n scalar(0).variable();\n this.accBeta1 = scalar(beta1).variable();\n };\n if (epsilon == null) {\n this.epsilon = ENGINE.backend.epsilon();\n }\n }\n applyGradients(variableGradients:\n NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) :\n Object.keys(variableGradients);\n tidy() => {\n const\n oneMinusAccBeta1 = sub(1, this.accBeta1);\n const lr =\n div(-this.learningRate, add(mul(this.iteration,\n this.decay), 1));\n variableNames.forEach((name, i) => {\n const value =\n ENGINE.registeredVariables[name];\n const trainable = false;\n if (this.accumulatedFirstMoment[i] ==\n null) {\n this.accumulatedFirstMoment[i] = {\n originalName: `${name}/m`,\n variable:\n zerosLike(value).variable(trainable)\n };\n if (this.accumulatedWeightedInfNorm[i] == null) {\n this.accumulatedWeightedInfNorm[i] = {\n originalName: `${name}/v`,\n variable:\n zerosLike(value).variable(trainable)\n };\n const gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n if (gradient == null) {\n return;\n }\n const firstMoment = this.accumulatedFirstMoment[i].variable;\n const weightedInfNorm =\n this.accumulatedWeightedInfNorm[i].variable;\n const newFirstMoment =\n add(mul(firstMoment,\n this.beta1), mul(gradient, 1 - this.beta1));\n const ut0 = mul(weightedInfNorm, this.beta2);\n const ut1 =\n abs(gradient);\n const newWeightedInfNorm = maximum(ut0, ut1);\n firstMoment.assign(newFirstMoment);\n weightedInfNorm.assign(newWeightedInfNorm);\n const\n newValue =\n add(mul(div(lr, oneMinusAccBeta1),\n div(newFirstMoment,\n add(newWeightedInfNorm, this.epsilon))),\n value);\n value.assign(newValue);\n };\n this.iteration.assign(add(this.iteration, 1));\n this.accBeta1.assign(mul(this.accBeta1, this.beta1));\n };\n }\n this.incrementIterations();\n }\n dispose(): void {\n this.accBeta1.dispose();\n this.iteration.dispose();\n if (this.accumulatedFirstMoment != null) {\n dispose(this.accumulatedFirstMoment.map(v => v.variable));\n }\n if (this.accumulatedWeightedInfNorm != null) {\n dispose(this.accumulatedWeightedInfNorm.map(v =>\n v.variable));\n }\n }\n async getWeights(): Promise<NamedTensor[]> {\n throw new Error('getWeights() is\n not implemented for Adamax yet.);\n }\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n throw new Error('setWeights() is not implemented for Adamax yet.);\n }\n getConfig(): ConfigDict {\n return
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{\n 'learningRate': this.learningRate,\n 'beta1': this.beta1,\n 'beta2': this.beta2,\n 'epsilon': this.epsilon,\n 'decay': this.decay\n });\n}\n\n/** @nocollapse */\nstatic fromConfig<T extends Serializable>(\n cls:\n SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(\n config['learningRate'],\n config['beta1'], config['beta2'],\n config['epsilon'], config['decay']);\n}\n}\n\nregisterClass(AdamaxOptimizer);\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights\n * Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {keep, tidy} from './globals';\nimport {add} from\n './ops/add';\nimport {mul} from './ops/mul';\nimport {scalar} from './ops/scalar';\nimport {ConfigDict,\n registerClass, Serializable, SerializableConstructor} from './serialization';\nimport {Scalar} from './tensor';\nimport\n {NamedTensor, NamedTensorMap} from './tensor_types';\n\nimport {Optimizer} from './optimizer';\n\n/**\n @doclink Optimizer */\nexport class SGDOptimizer extends Optimizer {\n /** @nocollapse */\n static className\n = 'SGD'; // Note: Name matters for Python compatibility.\n protected c: Scalar;\n\n constructor(protected\n learningRate: number) {\n super();\n this.setLearningRate(learningRate);\n }\n\n applyGradients(variableGradients: NamedTensorMap|NamedTensor[]) {\n const varNames =\n Array.isArray(variableGradients) ?\n variableGradients.map(v => v.name) :\n Object.keys(variableGradients);\n varNames.forEach((name, i) => {\n const gradient =\n Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n if\n (gradient == null) {\n return;\n }\n const value = ENGINE.registeredVariables[name];\n tidy(() => {\n const newValue = add(mul(this.c, gradient), value);\n value.assign(newValue);\n });\n });\n this.incrementIterations();\n }\n\n /**\n * Sets the learning rate of the optimizer.\n */\n\n setLearningRate(learningRate: number) {\n this.learningRate = learningRate;\n if (this.c != null) {\n this.c.dispose();\n }\n this.c = keep(scalar(-learningRate));\n }\n\n dispose() {\n this.c.dispose();\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n return [await this.saveIterations()];\n }\n\n async\n setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await\n this.extractIterations(weightValues);\n if (weightValues.length !== 0) {\n throw new Error('SGD optimizer\n does not have settable weights.);\n }\n }\n\n getConfig(): ConfigDict {\n return {'learningRate':\n this.learningRate};\n }\n\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n cls:\n SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config['learningRate']);\n }\n}\n\nregisterClass(SGDOptimizer);\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nimport {ENGINE} from './engine';\nimport {dispose, tidy} from './globals';\nimport {add} from\n './ops/add';\nimport {mul} from './ops/mul';\nimport {scalar} from './ops/scalar';\nimport {zerosLike} from\n './ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from\n './serialization';\nimport {Scalar, Tensor} from './tensor';\nimport {NamedTensor, NamedVariableMap} from\n './tensor_types';\n\nimport {OptimizerVariable} from './optimizer';\nimport {SGDOptimizer} from\n './sgd_optimizer';\n\n/** @doclink Optimizer */\nexport class MomentumOptimizer extends SGDOptimizer {\n /**
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@nocollapse */
static className = 'Momentum'; // Name matters for Python compatibility.
private m:
Scalar;
private accumulations: OptimizerVariable[] = [];

constructor(
 protected learningRate: number,
 private momentum: number,
 private useNesterov = false) {
 super(learningRate);
 this.m =
 scalar(this.momentum);
}

applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {
 const variableNames = Array.isArray(variableGradients) ?
 variableGradients.map(item => item.name) :
 Object.keys(variableGradients);
 variableNames.forEach((name, i) => {
 const value =
 ENGINE.registeredVariables[name];
 if (this.accumulations[i] == null) {
 const trainable = false;
 this.accumulations[i] = {
 originalName: `${name}/momentum`,
 variable: tidy(() =>
 zerosLike(value).variable(trainable))
 };
 const accumulation = this.accumulations[i].variable;
 const gradient = Array.isArray(variableGradients) ?
 variableGradients[i].tensor :
 variableGradients[name];
 if (gradient == null) {
 return;
 }
 tidy(() => {
 let newValue:
 Tensor;
 const newAccumulation = add(mul(this.m, accumulation), gradient);
 if (this.useNesterov) {
 newValue = add(
 mul(this.c, add(gradient, mul(newAccumulation, this.m))),
 value);
 } else {
 newValue = add(mul(this.c, newAccumulation), value);
 }
 accumulation.assign(newAccumulation);
 value.assign(newValue);
 });
 this.incrementIterations();
 }
 dispose(): void {
 this.m.dispose();
 if (this.accumulations != null) {
 dispose(this.accumulations.map(v => v.variable));
 }
 }
 });
}

/**
 * Sets the momentum of the optimizer.
 * @param momentum
 */
setMomentum(momentum: number) {
 this.momentum = momentum;
}

async getWeights():
Promise<NamedTensor[]> {
 // Order matters for Python compatibility.
 return [await
 this.saveIterations().concat(this.accumulations.map(
 v => ({name: v.originalName, tensor: v.variable}))];
}

async setWeights(weightValues: NamedTensor[]): Promise<void> {
 weightValues = await
 this.extractIterations(weightValues);
 const trainable = false;
 this.accumulations = weightValues.map(
 v => ({originalName: v.name, variable: v.tensor.variable(trainable)});
 }

getConfig(): ConfigDict {
 return {
 'learningRate': this.learningRate,
 'momentum': this.momentum,
 'useNesterov': this.useNesterov
 };
}

/** @nocollapse */
static fromConfig<T extends Serializable>(
 cls: SerializableConstructor<T>,
 config: ConfigDict): T {
 return new cls(
 config['learningRate'], config['momentum'],
 config['useNesterov']);
}

registerClass(MomentumOptimizer);
"/**
 * @license
 * Copyright 2018
 * Google LLC. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing,
 * software distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

=====
*/
import {ENGINE} from './engine';
import {dispose, tidy} from './globals';
import {add} from './ops/add';
import {div} from './ops/div';
import {mul} from './ops/mul';
import {sqrt} from './ops/sqrt';
import {square} from './ops/square';
import {sub} from './ops/sub';
import {zerosLike} from './ops/zeros_like';
import {ConfigDict, registerClass, Serializable, SerializableConstructor} from './serialization';
import {NamedTensor, NamedTensorMap} from './tensor_types';
import {Optimizer, OptimizerVariable} from './optimizer';

/** @doclink Optimizer */
export class RMSPropOptimizer extends Optimizer {
 /** @nocollapse */
 static className = 'RMSProp'; // Note: Name matters for Python compatibility.
 private centered: boolean;
 private accumulatedMeanSquares: OptimizerVariable[] = [];
 private accumulatedMoments: OptimizerVariable[] = [];
 private accumulatedMeanGrads: OptimizerVariable[] = [];

 constructor(
 protected learningRate: number, protected decay = 0.9,
 protected momentum = 0.0, protected epsilon: number = null,
 centered = false) {
 super();
 this.centered = centered;
 if (epsilon == null) {
 this.epsilon = ENGINE.backend.epsilon();
 }
 if (learningRate == null) {
 throw new Error('learningRate for RMSPropOptimizer must be defined.');
```

```

Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) :\n
Object.keys(variableGradients);\n\n variableNames.forEach((name, i) => {\n const value =
ENGINE.registeredVariables[name];\n const trainable = false;\n if (this.accumulatedMeanSquares[i] == null)
{\n this.accumulatedMeanSquares[i] = {\n originalName: `${name}/rms`,\n variable: tidy(() =>
zerosLike(value).variable(trainable))\n };\n }\n if (this.accumulatedMoments[i] == null) {\n
this.accumulatedMoments[i] = {\n originalName: `${name}/momentum`,\n variable: tidy(() =>
zerosLike(value).variable(trainable))\n };\n }\n if (this.accumulatedMeanGrads[i] == null &&
this.centered) {\n this.accumulatedMeanGrads[i] = {\n originalName: `${name}/mg`,\n variable:
tidy(() => zerosLike(value).variable(trainable))\n };\n }\n\n const gradient =
Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n if
(gradient == null) {\n return;\n }\n\n const accumulatedMeanSquare =
this.accumulatedMeanSquares[i].variable;\n const accumulatedMoments =
this.accumulatedMoments[i].variable;\n tidy(() => {\n const newAccumulatedMeanSquare =\n
add(mul(accumulatedMeanSquare, this.decay),\n mul(square(gradient), 1 - this.decay));\n\n if
(this.centered) {\n const accumulatedMeanGrad = this.accumulatedMeanGrads[i].variable;\n // Centered
gradient\n const newAccumulatedMeanGrad =\n add(mul(accumulatedMeanGrad, this.decay),\n mul(gradient, 1 - this.decay));\n\n const gradContribution =\n div(mul(gradient,
this.learningRate),\n sqrt(\n sub(newAccumulatedMeanSquare,\n
add(square(newAccumulatedMeanGrad), this.epsilon)));\n const newAccumulatedMoments =\n
add(mul(accumulatedMoments, this.momentum), gradContribution);\n\n
accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n
accumulatedMeanGrad.assign(newAccumulatedMeanGrad);\n
accumulatedMoments.assign(newAccumulatedMoments);\n\n const newValue = sub(value,
newAccumulatedMoments);\n value.assign(newValue);\n } else {\n // Plain gradient\n const
newAccumulatedMeanSquare =\n add(mul(accumulatedMeanSquare, this.decay),\n
mul(square(gradient), 1 - this.decay));\n\n const newAccumulatedMoments =\n
add(mul(accumulatedMoments, this.momentum),\n div(mul(gradient, this.learningRate),\n
sqrt(add(newAccumulatedMeanSquare, this.epsilon)));\n\n
accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n
accumulatedMoments.assign(newAccumulatedMoments);\n\n const newValue = sub(value,
newAccumulatedMoments);\n value.assign(newValue);\n }\n });\n });\n
this.incrementIterations();\n }\n\n dispose(): void {\n if (this.accumulatedMeanSquares != null) {\n
dispose(this.accumulatedMeanSquares.map(v => v.variable));\n }\n if (this.accumulatedMeanGrads != null &&
this.centered) {\n dispose(this.accumulatedMeanGrads.map(v => v.variable));\n }\n if
(this.accumulatedMoments != null) {\n dispose(this.accumulatedMoments.map(v => v.variable));\n }\n }\n\n
async getWeights(): Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables:
OptimizerVariable[] =\n [...this.accumulatedMeanSquares, ...this.accumulatedMoments];\n if (this.centered)
{\n variables.push(...this.accumulatedMeanGrads);\n }\n return [await this.saveIterations()].concat(\n
variables.map(v => ({name: v.originalName, tensor: v.variable}));\n }\n\n async setWeights(weightValues:
NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const
variableCount =\n this.centered ? weightValues.length / 3 : weightValues.length / 2;\n const trainable =
false;\n this.accumulatedMeanSquares =\n weightValues.slice(0, variableCount).map(v => ({\n
originalName: v.name,\n variable: v.tensor.variable(\n
trainable)\n }));\n this.accumulatedMoments =\n
weightValues.slice(variableCount, variableCount * 2)\n .map(v => ({\n originalName: v.name,\n
variable: v.tensor.variable(trainable)\n }));\n if (this.centered) {\n
this.accumulatedMeanGrads =\n weightValues.slice(variableCount * 2, variableCount * 3)\n .map(v
=> ({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n

```

```

}\n }\n\n getConfig(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'decay': this.decay,\n 'momentum': this.momentum,\n 'epsilon': this.epsilon,\n 'centered': this.centered\n };}\n\n /**
@nocollapse */\n static fromConfig<T extends Serializable>(\n cls: SerializableConstructor<T>, config:
ConfigDict): T {\n return new cls(\n config['learningRate'], config['decay'], config['momentum'],\n config['epsilon'], config['centered']);}\n\n }\n\n registerClass(RMSPropOptimizer);\n\n "/*\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====}\n
*/\n\n import {AdadeltaOptimizer} from './adadelta_optimizer';\n import {AdagradOptimizer} from
 './adagrad_optimizer';\n import {AdamOptimizer} from './adam_optimizer';\n import {AdamaxOptimizer} from
 './adamax_optimizer';\n import {MomentumOptimizer} from './momentum_optimizer';\n import
 {RMSPropOptimizer} from './rmsprop_optimizer';\n import {SGDOptimizer} from './sgd_optimizer';\n\n export class
OptimizerConstructors {\n /**\n * Constructs a `tf.SGDOptimizer` that uses stochastic gradient descent.\n *
```js\n   * // Fit a quadratic function by learning the coefficients a, b, c.\n   * const xs = tf.tensor1d([0, 1, 2, 3]);\n   *
const ys = tf.tensor1d([1.1, 5.9, 16.8, 33.9]);\n   * \n   * const a = tf.scalar(Math.random()).variable();\n   * const b =
tf.scalar(Math.random()).variable();\n   * const c = tf.scalar(Math.random()).variable();\n   * \n   * // y = a * x^2 + b *
x + c.\n   * const f = x => a.mul(x.square()).add(b.mul(x)).add(c);\n   * const loss = (pred, label) =>
pred.sub(label).square().mean();\n   * \n   * const learningRate = 0.01;\n   * const optimizer =
tf.train.sgd(learningRate);\n   * \n   * // Train the model.\n   * for (let i = 0; i < 10; i++) {\n   *   optimizer.minimize(()
=> loss(f(xs), ys));\n   * }\n   * \n   * // Make predictions.\n   * console.log(\n   *   `a: ${a.dataSync()}, b:
${b.dataSync()}, c: ${c.dataSync()}`);\n   * const preds = f(xs).dataSync();\n   * preds.forEach((pred, i) => {\n   *
console.log(`x: ${i}, pred: ${pred}`);\n   * });\n   * ```\n   * \n   * @param learningRate The learning rate to use for
the SGD algorithm.\n   * \n   * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n   * \n   * \n   *
static sgd(learningRate: number): SGDOptimizer {\n   *   return new SGDOptimizer(learningRate);\n   * }\n\n /**\n   *
Constructs a `tf.MomentumOptimizer` that uses momentum gradient\n   * descent.\n   * \n   * See\n   *
\[http://proceedings.mlr.press/v28/sutskever13.pdf\]\n   * \n   * \n   *
\[http://proceedings.mlr.press/v28/sutskever13.pdf\]\n   * \n   *
@param learningRate The learning rate to use for the Momentum gradient\n   * descent algorithm.\n   * @param
momentum The momentum to use for the momentum gradient descent\n   * algorithm.\n   * \n   * @doc {heading:
'Training', subheading: 'Optimizers', namespace: 'train'}\n   * \n   * \n   * static momentum(learningRate: number,
momentum: number, useNesterov = false):\n   *   MomentumOptimizer {\n   *     return new
MomentumOptimizer(learningRate, momentum, useNesterov);\n   *   }\n\n /**\n   * Constructs a
`tf.RMSPropOptimizer` that uses RMSProp gradient\n   * descent. This implementation uses plain momentum and
is not centered\n   * version of RMSProp.\n   * \n   * See\n   *
\[http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture\_slides\_lec6.pdf\]\n   * \n   *
\[http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture\_slides\_lec6.pdf\]\n   * \n   * @param learningRate The
learning rate to use for the RMSProp gradient\n   * descent algorithm.\n   * @param decay The discounting factor
for the history/coming gradient.\n   * @param momentum The momentum to use for the RMSProp gradient
descent\n   * algorithm.\n   * @param epsilon Small value to avoid zero denominator.\n   * @param centered If true,
gradients are normalized by the estimated\n   * variance of the gradient.\n   * \n   * @doc {heading: 'Training',
subheading: 'Optimizers', namespace: 'train'}\n   * \n   * \n   * static rmsprop(\n   *   learningRate: number, decay = .9,
momentum = 0.0, epsilon: number = null,\n   *   centered = false): RMSPropOptimizer {\n   *     return new
RMSPropOptimizer(\n   *       learningRate, decay, momentum, epsilon, centered);\n   *   }\n\n /**\n   * Constructs a
`tf.AdamOptimizer` that uses the Adam algorithm.\n   * \n   * See\n   *
\[https://arxiv.org/abs/1412.6980\]\n   * \n   * \n   * \n   *
\[https://arxiv.org/abs/1412.6980\]\n   * \n   * @param learningRate The learning rate

```

```

to use for the Adam gradient descent algorithm.
@param beta1 The exponential decay rate for the 1st
moment estimates.
@param beta2 The exponential decay rate for the 2nd moment estimates.
@param epsilon A small constant for numerical stability.
@doc {heading: 'Training', subheading: 'Optimizers',
namespace: 'train'}
static adam(
    learningRate = 0.001, beta1 = 0.9, beta2 = 0.999,
    epsilon: number = null): AdamOptimizer {
    return new AdamOptimizer(learningRate, beta1, beta2, epsilon);
}

Constructs a `tf.AdadeltaOptimizer` that uses the Adadelta algorithm.
See
[https://arxiv.org/abs/1212.5701](https://arxiv.org/abs/1212.5701)
@param learningRate The learning rate
to use for the Adadelta gradient descent algorithm.
@param rho The learning rate decay over each
update.
@param epsilon A constant epsilon used to better condition the grad
update.
@doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}
static adadelta(learningRate = .001, rho =
.95, epsilon: number = null):
    AdadeltaOptimizer {
    return new AdadeltaOptimizer(learningRate, rho,
epsilon);
}

Constructs a `tf.AdamaxOptimizer` that uses the Adamax algorithm.
See
[https://arxiv.org/abs/1412.6980](https://arxiv.org/abs/1412.6980)
@param learningRate The learning rate
to use for the Adamax gradient descent algorithm.
@param beta1 The exponential decay rate for the 1st
moment estimates.
@param beta2 The exponential decay rate for the 2nd moment estimates.
@param epsilon A small constant for numerical stability.
@param decay The learning rate decay over each update.
@doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}
static adamax(
    learningRate = 0.002, beta1 = 0.9, beta2 = 0.999, epsilon: number = null,
    decay = 0.0): AdamaxOptimizer {
    return new AdamaxOptimizer(learningRate, beta1, beta2, epsilon, decay);
}

Constructs a
`tf.AdagradOptimizer` that uses the Adagrad algorithm.
See
[http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf](http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf)
or
[http://ruder.io/optimizing-gradient-descent/index.html#adagrad](http://ruder.io/optimizing-gradient-descent/index.html#adagrad)
@param learningRate The learning rate to use for the Adagrad gradient
descent algorithm.
@param
initialAccumulatorValue Starting value for the accumulators, must be
positive.
@doc {heading:
'Training', subheading: 'Optimizers', namespace: 'train'}
static adagrad(learningRate: number,
initialAccumulatorValue = 0.1):
    AdagradOptimizer {
    return new AdagradOptimizer(learningRate,
initialAccumulatorValue);
}

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distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language
governing permissions and
limitations under the License.
=====
// So typings can propagate.
import {AdadeltaOptimizer} from './optimizers/adadelta_optimizer';
import
{AdagradOptimizer} from './optimizers/adagrad_optimizer';
import {AdamOptimizer} from
'./optimizers/adam_optimizer';
import {AdamaxOptimizer} from './optimizers/adamax_optimizer';
import
{MomentumOptimizer} from './optimizers/momentum_optimizer';
import {OptimizerConstructors} from
'./optimizers/optimizer_constructors';
import {RMSPropOptimizer} from
'./optimizers/rmsprop_optimizer';
import {SGDOptimizer} from './optimizers/sgd_optimizer';
// tslint:disable-
next-line:no-unused-expression
[MomentumOptimizer, SGDOptimizer, AdadeltaOptimizer, AdagradOptimizer,
RMSPropOptimizer, AdamaxOptimizer, AdamOptimizer];
export const train = {
    sgd:
OptimizerConstructors.sgd,
    momentum: OptimizerConstructors.momentum,
    adadelta:
OptimizerConstructors.adadelta,
    adagrad: OptimizerConstructors.adagrad,
    rmsprop:
OptimizerConstructors.rmsprop,
    adamax: OptimizerConstructors.adamax,
    adam:
OptimizerConstructors.adam
};

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```

compliance with the License.\n * You may obtain a copy of the License at\n *\n * <http://www.apache.org/licenses/LICENSE-2.0>\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nconst delayCallback: Function = (() => {\n  if (typeof requestAnimationFrame !== 'undefined') {\n    return requestAnimationFrame;\n  } else if (typeof setImmediate !== 'undefined') {\n    return setImmediate;\n  }\n  return (f: Function) => f(); // no delays\n})();\n\n/**\n * Returns a promise that resolve when a requestAnimationFrame has completed.\n *\n * On Node.js this uses setImmediate instead of requestAnimationFrame.\n *\n * This is simply a sugar method so that users can do the following:\n * `await tf.nextFrame();`\n *\n * @doc {heading: 'Performance', subheading: 'Timing'}\n *\n * @function nextFrame(): Promise<void> {\n  return new Promise<void>(resolve => delayCallback(() => resolve()));\n}\n\nexport {nextFrame};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport * as util from './util';\n\nexport function assertParamsConsistent(shapes: number[][], axis: number) {\n  const rank = shapes[0].length;\n  shapes.forEach((shape, i) => {\n    util.assert(\n      shape.length === rank,\n      () => `Error in concat${rank}D: rank of tensors[${i}] must be the same ` +\n        `as the rank of the rest (${rank})`);\n    util.assert(\n      axis >= 0 && axis < rank,\n      () => `Error in concat${rank}D: axis must be between 0 and ${rank - 1}.`);\n    const firstShape = shapes[0];\n    shapes.forEach((shape, i) => {\n      for (let r = 0; r < rank; r++) {\n        util.assert(\n          (r === axis) || (shape[r] === firstShape[r]),\n          () => `Error in concat${rank}D: Shape of tensors[${i}] (${shape}) ` +\n            `does not match the shape of the rest (${firstShape}) ` +\n            `along the non-concatenated axis ${i}.`);\n      }\n    });\n  });\n\n  export function computeOutShape(shapes: number[][], axis: number): number[] {\n    const outputShape = shapes[0].slice();\n    for (let i = 1; i < shapes.length; i++) {\n      outputShape[axis] += shapes[i][axis];\n    }\n    return outputShape;\n  }\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\n/**\n * Inputs of size above this threshold will be parallelized by calling multiple\n * shader programs.\n *\n * @import {nearestDivisor} from './util';\n *\n * @const PARALLELIZE_THRESHOLD = 30;\n *\n * @interface ReduceInfo {\n  windowSize: number;\n  batchSize: number;\n  inSize: number;\n  outSize: number;\n}\n\nexport function computeOptimalWindowSize(inSize: number): number {\n  if (inSize <= PARALLELIZE_THRESHOLD) {\n    return inSize;\n  }\n  return nearestDivisor(inSize, Math.floor(Math.sqrt(inSize)));\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```

=====
*\n\n// Returns the image center in pixels.\nexport function getImageCenter(\n  center: number|[number, number],\n  imageHeight: number,\n  imageWidth: number): [number, number] {\n  const centerX =\n    imageWidth *\n    (typeof center === 'number' ? center : center[0]);\n  const centerY =\n    imageHeight * (typeof center ===\n    'number' ? center : center[1]);\n  return [centerX, centerY];\n}\n", "/*\n * @license\n * Copyright 2018 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
=====
*\n\n**\n * Gets the new shape of the input Tensor after it's been reshaped\n * to:\n * [blockShape[0], ...,
blockShape[M-1], batch / prod(blockShape)],\n * inputShape[1], ..., inputShape[N-1]]\n *\n * See step 1:
https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n *\nexport function getReshaped(\n  inputShape: number[], blockShape: number[], prod: number,\n  batchToSpace = true): number[] {\n  let reshaped:
number[] = [];\n  if (batchToSpace) {\n    reshaped = reshaped.concat(blockShape.slice(0));\n    reshaped.push(inputShape[0] / prod);\n    reshaped = reshaped.concat(inputShape.slice(1));\n  } else {\n    reshaped
= reshaped.concat(inputShape[0]);\n    const spatialLength = blockShape.length;\n    for (let i = 0; i < spatialLength;\n    ++i) {\n      reshaped =\n        reshaped.concat([inputShape[i + 1] / blockShape[i], blockShape[i]]);\n    }\n    reshaped = reshaped.concat(inputShape.slice(spatialLength + 1));\n  }\n  return reshaped;\n}\n\n**\n * Gets the
permutation that will transpose the dimensions of the\n * reshaped tensor to shape:\n *\n * [batch /
prod(block_shape),inputShape[1], blockShape[0], ..., \n * inputShape[M], blockShape[M-1],inputShape[M+1], ...,
inputShape[N-1]]\n *\n * see step 2: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n *\nexport
function getPermuted(\n  reshapedRank: number, blockShapeRank: number,\n  batchToSpace = true): number[]
{\n  const permuted = [];\n  if (batchToSpace) {\n    permuted.push(blockShapeRank);\n    for (let i =
blockShapeRank + 1; i < reshapedRank; ++i) {\n      if (i <= 2 * blockShapeRank) {\n        permuted.push(i);\n        permuted.push(i - (blockShapeRank + 1));\n      } else {\n        permuted.push(i);\n      }\n    } else {\n      const
permutedBeforeBatch = [];\n      const permutedAfterBatch = [];\n      for (let i = 1; i < reshapedRank; ++i) {\n        if (i
>= blockShapeRank * 2 + 1 || i % 2 === 1) {\n          permutedAfterBatch.push(i);\n        } else {\n          permutedBeforeBatch.push(i);\n        }\n      }\n      permuted.push(...permutedBeforeBatch);\n      permuted.push(0);\n      permuted.push(...permutedAfterBatch);\n    }\n    return permuted;\n}\n\n**\n * Gets the shape of the reshaped and
permuted input Tensor before any cropping\n * is applied. The new shape will be:\n *\n * [batch /
prod(blockShape),inputShape[1] * blockShape[0], ..., \n * inputShape[M] * blockShape[M-1],inputShape[M+1], ...,
inputShape[N-1]]\n *\n * See step 3: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n *\nexport
function getReshapedPermuted(\n  inputShape: number[], blockShape: number[], prod: number,\n  batchToSpace = true): number[] {\n  const reshapedPermuted = [];\n\n  if (batchToSpace) {\n    reshapedPermuted.push(inputShape[0] / prod);\n  } else {\n    reshapedPermuted.push(inputShape[0] * prod);\n  }\n\n  for (let i = 1; i < inputShape.length; ++i) {\n    if (i <= blockShape.length) {\n      if (batchToSpace) {\n        reshapedPermuted.push(blockShape[i - 1] * inputShape[i]);\n      } else {\n        reshapedPermuted.push(inputShape[i] / blockShape[i - 1]);\n      }\n    } else {\n      reshapedPermuted.push(inputShape[i]);\n    }\n  }\n  return reshapedPermuted;\n}\n\n**\n * Converts the crops
argument into the beginning coordinates of a slice\n * operation.\n *\nexport function getSliceBeginCoords(\n  crops: number[[]], blockShape: number): number[] {\n  const sliceBeginCoords = [0];\n  for (let i = 0; i <
blockShape; ++i) {\n    sliceBeginCoords.push(crops[i][0]);\n  }\n  return sliceBeginCoords;\n}\n\n**\n * Converts
the crops argument into the size of a slice operation. When\n * combined with getSliceBeginCoords this function
allows the reshaped and\n * permuted Tensor to be cropped to its final output shape of:\n *\n * inputShape[1] *
blockShape[0] - crops[0,0] - crops[0,1], ..., \n * inputShape[M] * blockShape[M-1] -crops[M-1,0] -\n * crops[M-

```

```

1,1],inputShape[M+1], ..., inputShape[N-1]]\n * See step 4:
https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n * ^\nexport function getSliceSize(\n
uncroppedShape: number[], crops: number[[]], blockShape: number): number[] {\n  const sliceSize =
uncroppedShape.slice(0, 1);\n  for (let i = 0; i < blockShape; ++i) {\n    sliceSize.push(uncroppedShape[i + 1] -
crops[i][0] - crops[i][1]);\n  }\n  return sliceSize;\n}\n", "/*\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nexport const SELU_SCALEALPHA = 1.7580993408473768599402175208123;\nexport const SELU_SCALE
= 1.0507009873554804934193349852946;\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nexport const ERF_P = 0.3275911;\nexport const ERF_A1 = 0.254829592;\nexport const ERF_A2 = -
0.284496736;\nexport const ERF_A3 = 1.421413741;\nexport const ERF_A4 = -1.453152027;\nexport const
ERF_A5 = 1.061405429;\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {env} from './environment';\n\nexport function warn(...msg: Array<{}>): void {\n  if
(!env().getBool('IS_TEST')) {\n    console.warn(...msg);\n  }\n}\n\nexport function log(...msg: Array<{}>): void {\n
if (!env().getBool('IS_TEST')) {\n    console.log(...msg);\n  }\n}\n", "/*\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {TypedArray} from './types';\n/*\n * Merges real and imaginary Float32Arrays into a single complex
Float32Array.\n * \n * The memory layout is interleaved as follows:\n * real: [r0, r1, r2]\n * imag: [i0, i1, i2]\n *
complex: [r0, i0, r1, i1, r2, i2]\n * \n * This is the inverse of splitRealAndImagArrays.\n * \n * @param real The real
values of the complex tensor values.\n * @param imag The imag values of the complex tensor values.\n * @returns
A complex tensor as a Float32Array with merged values.\n */\nexport function mergeRealAndImagArrays(\n  real:
Float32Array, imag: Float32Array): Float32Array {\n  if (real.length !== imag.length) {\n    throw new Error(\n
`Cannot merge real and imag arrays of different lengths. real: ` +\n      `${real.length}, imag: ${imag.length}.`);\n

```



```

const negIndex = numOrSizeSplits.indexOf(-1);\n // Allow the number of split array to be -1, which indicates the
rest\n // of dimension is allocated to that split.\n if (negIndex !== -1) {\n   const total =
numOrSizeSplits.reduce((a, b) => b > 0 ? a + b : a);\n   numOrSizeSplits[negIndex] = x.shape[axis] - total;\n }
assert(\n   x.shape[axis] === numOrSizeSplits.reduce((a, b) => a + b),\n   () => "The sum of sizes must match
the size of the axis dimension.");\n   splitSizes = numOrSizeSplits;\n }
return splitSizes;\n }
"/**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====
*\n\nimport {TensorInfo} from '../kernel_registry';\nimport {nearestDivisor} from '../util';\nimport
{PARALLELIZE_THRESHOLD} from './reduce_util';\n\nexport interface SegOpInfo {\n  windowSize: number;\n
batchSize: number;\n  inSize: number;\n  numSegments: number;\n}\n\nexport function
segOpComputeOptimalWindowSize(\n  inSize: number, numSegments: number): number {\n  let done = false;\n
let res;\n  if (inSize <= PARALLELIZE_THRESHOLD) {\n    res = inSize;\n    done = true;\n  } else {\n    res =
nearestDivisor(inSize, Math.floor(Math.sqrt(inSize)));\n  }\n  while (!done) {\n    if (res > numSegments || res ===
inSize) {\n      done = true;\n    } else {\n      res = nearestDivisor(inSize, res + 1);\n    }\n  }\n  return
res;\n}\n\nexport function computeOutShape(\n  aShape: number[], axis: number, numSegments: number):
number[] {\n  const outShape = [];\n  const rank = aShape.length;\n  for (let dim = 0; dim < rank; dim++) {\n
  if (dim !== axis) {\n    outShape.push(aShape[dim]);\n  } else {\n    outShape.push(numSegments);\n  }\n}\n
return outShape;\n}\n\nexport interface GatherOpShapeInfo {\n  batchSize: number;\n  sliceSize: number;\n
outerSize: number;\n  dimSize: number;\n  outputShape: number[];\n}\n\nexport function
collectGatherOpShapeInfo(\n  x: TensorInfo, indices: TensorInfo, axis: number,\n  batchDims: number):
GatherOpShapeInfo {\n  const indicesRank = indices.shape.length;\n  const xRank = x.shape.length;\n\n  if
(batchDims !== 0) {\n    if (batchDims < -indicesRank || batchDims > indicesRank) {\n      throw new Error(`Expect
batchDims in the range of [-${indicesRank}, ${indicesRank}], but got ${batchDims}`);\n    }\n  }\n\n  if
(batchDims < 0) {\n    batchDims += indicesRank;\n  }\n\n  if (batchDims > xRank) {\n    throw new
Error(`batchDims (${batchDims}) must be less than rank(x) (${xRank}).`);\n  }\n\n  if (axis < batchDims) {\n
throw new Error(`batchDims (${batchDims}) must be less than or equal to axis (${axis}).`);\n  }\n\n  for (let
i = 0; i < batchDims; ++i) {\n    if (x.shape[i] !== indices.shape[i]) {\n      throw new Error(\n        `x.shape[${i}]:
${x.shape[i]} should be equal to indices.shape[${i}]: ${indices.shape[i]}`);\n    }\n  }\n\n  const dimSize =
x.shape[axis];\n\n  const outputShape: number[] = [];\n  let batchSize = 1;\n  let outerSize = 1;\n  let sliceSize =
1;\n\n  for (let i = 0; i < batchDims; ++i) {\n    outputShape.push(x.shape[i]);\n    batchSize *= x.shape[i];\n  }\n\n
for (let i = batchDims; i < axis; i++) {\n    outputShape.push(x.shape[i]);\n    outerSize *= x.shape[i];\n  }\n\n
for (let i = batchDims; i < indicesRank; i++) {\n    outputShape.push(indices.shape[i]);\n  }\n\n  for (let i = axis + 1; i <
xRank; i++) {\n    outputShape.push(x.shape[i]);\n    sliceSize *= x.shape[i];\n  }\n\n  return {batchSize, sliceSize,
outerSize, dimSize, outputShape};\n}\n"/**\n *
@license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */

```

```

=====
*\n\nimport {decodeString, encodeString} from '../util';\n\n// Utilities needed by backend consumers of tf-
core.\nexport * from '../ops/axis_util';\nexport * from '../ops/broadcast_util';\nexport * from

```

```
../ops/concat_util';\nextport * from '../ops/conv_util';\nextport * from '../ops/fused_util';\nextport * from
../ops/fused_types';\nextport * from '../ops/reduce_util';\n\nimport * as slice_util from '../ops/slice_util';\nextport
{slice_util};\n\nexport {BackendValues, TypedArray, upcastType, PixelData} from './types';\nextport
{MemoryInfo, TimingInfo} from './engine';\nextport * from '../ops/rotate_util';\nextport * from
../ops/array_ops_util';\nextport * from '../ops/gather_nd_util';\nextport * from '../ops/scatter_nd_util';\nextport * from
../ops/selu_util';\nextport * from '../ops/fused_util';\nextport * from '../ops/erf_util';\nextport * from './log';\nextport *
from './backends/complex_util';\nextport * from '../ops/split_util';\n\nimport * as segment_util from
../ops/segment_util';\nextport {segment_util};\n\nexport function fromUint8ToStringArray(vals: Uint8Array[]) {\n
try {\n // Decode the bytes into string.\n return vals.map(val => decodeString(val));\n } catch (err) {\n throw
new Error(\n Failed to decode encoded string bytes into utf-8, error: ${err}`);\n }\n}\n\nexport function
fromStringArrayToUint8(strings: string[]) {\n return strings.map(s => encodeString(s));\n}\n\n"/**\n * @license\n
* Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nexport {nonMaxSuppressionV3Impl, nonMaxSuppressionV4Impl, nonMaxSuppressionV5Impl} from
../non_max_suppression_impl';\nextport {whereImpl} from '../where_impl';\n\n"/**\n * @license\n
* Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
* http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\n// base.ts is tfjs-core without auto registration of things like flags,\n// gradients, chained ops or the opHandler.
See base_side_effects.ts for parts\n// tfjs core that are required side effects.\n\n"/**\n * @fileoverview\n
* @suppress {partialAlias} Optimization disabled due to passing the module\n * object into a function below:\n
*\n * import *\n * as ops from '../ops/ops';\n * setOpHandler(ops);\n *\n\n// Serialization.\n\nimport * as io from './io/io';\nimport * as
math from './math';\nimport * as browser from './ops/browser';\nimport * as gather_util from
../ops/gather_nd_util';\nimport * as scatter_util from '../ops/scatter_nd_util';\nimport * as slice_util from
../ops/slice_util';\nimport * as serialization from './serialization';\nimport * as tensor_util from './tensor_util';\nimport
* as test_util from './test_util';\nimport * as util from './util';\nimport {version} from './version';\n\nexport
{InferenceModel, MetaGraph, MetaGraphInfo, ModelPredictConfig, ModelTensorInfo, SavedModelTensorInfo,
SignatureDef, SignatureDefEntry, SignatureDefInfo} from './model_types';\n\n// Optimizers.\n\nexport
{AdadeltaOptimizer} from './optimizers/adadelta_optimizer';\nextport {AdagradOptimizer} from
../optimizers/adagrad_optimizer';\nextport {AdamOptimizer} from '../optimizers/adam_optimizer';\nextport
{AdamaxOptimizer} from '../optimizers/adamax_optimizer';\nextport {MomentumOptimizer} from
../optimizers/momentum_optimizer';\nextport {Optimizer} from '../optimizers/optimizer';\nextport
{RMSPropOptimizer} from '../optimizers/rmsprop_optimizer';\nextport {SGDOptimizer} from
../optimizers/sgd_optimizer';\nextport {Scalar, Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D, Tensor5D,
TensorBuffer, Variable} from './tensor';\nextport {GradSaveFunc, NamedTensorMap, TensorContainer,
TensorContainerArray, TensorContainerObject} from './tensor_types';\nextport {BackendValues, DataType,
DataTypeMap, DataValues, NumericDataType, PixelData, Rank, RecursiveArray, ScalarLike, ShapeMap,
sumOutType, TensorLike, TypedArray, upcastType} from './types';\n\nexport * from '../ops/ops';\nextport
{Reduction} from '../ops/loss_ops_utils';\n\nexport * from './train';\nextport * from './globals';\nextport * from
```

```

./kernel_registry';\nextport {customGrad, grad, grads, valueAndGrad, valueAndGrads, variableGrads} from
./gradients';\nextport {TimingInfo, MemoryInfo, ForwardFunc} from './engine';\nextport {Environment, env,
ENV} from './environment';\nextport {Platform} from './platforms/platform';\nextport {version as
version_core};\n\n// Top-level method exports.\nextport {nextFrame} from './browser_util';\n\n// Second level
exports.\nimport * as backend_util from './backends/backend_util';\nimport * as device_util from
./device_util';\nextport {\n browser,\n io,\n math,\n serialization,\n test_util,\n util,\n backend_util,\n
tensor_util,\n slice_util,\n gather_util,\n scatter_util,\n device_util\n};\nimport * as kernel_impls from
./backends/kernel_impls';\nextport {kernel_impls};\n\n// Backend specific.\nextport {KernelBackend,
BackendTimingInfo, DataMover, DataStorage} from './backends/backend';\n\n// Export all kernel names /
info.\nextport * from './kernel_names';\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n
\n\n// Required side effectful code.\nimport './base_side_effects';\n\n All exports from this package should be in
base.\nextport * from './base';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n
\n\nconst contexts: {[key: string]: WebGLRenderingContext} = {};\n\nconst WEBGL_ATTRIBUTES:
WebGLContextAttributes = {\n alpha: false,\n antialias: false,\n premultipliedAlpha: false,\n
preserveDrawingBuffer: false,\n depth: false,\n stencil: false,\n failIfMajorPerformanceCaveat: true\n};\n\n\nexport
function clearWebGLContext(webGLVersion: number) {\n delete contexts[webGLVersion];\n}\n\n\nexport function
setWebGLContext(\n webGLVersion: number, gl: WebGLRenderingContext) {\n contexts[webGLVersion] =
gl;\n}\n\n\nexport function getWebGLContext(webGLVersion: number): WebGLRenderingContext {\n if
(!(webGLVersion in contexts)) {\n const newCtx = getWebGLRenderingContext(webGLVersion);\n if (newCtx
!== null) {\n contexts[webGLVersion] = newCtx;\n } else {\n console.log('Could not get context for
WebGL version', webGLVersion);\n return null;\n }\n }\n const gl = contexts[webGLVersion];\n if
(gl.isContextLost()) {\n delete contexts[webGLVersion];\n return getWebGLContext(webGLVersion);\n }\n\n
gl.disable(gl.DEPTH_TEST);\n gl.disable(gl.STENCIL_TEST);\n gl.disable(gl.BLEND);\n
gl.disable(gl.DITHER);\n gl.disable(gl.POLYGON_OFFSET_FILL);\n gl.disable(gl.SAMPLE_COVERAGE);\n
gl.enable(gl.SCISSOR_TEST);\n gl.enable(gl.CULL_FACE);\n gl.cullFace(gl.BACK);\n\n return
contexts[webGLVersion];\n}\n\n\nfunction createCanvas(webGLVersion: number) {\n if (typeof OffscreenCanvas
!== 'undefined' && webGLVersion === 2) {\n return new OffscreenCanvas(300, 150);\n } else if (typeof
document !== 'undefined') {\n return document.createElement('canvas');\n } else {\n throw new Error('Cannot
create a canvas in this context');\n }\n}\n\n\nfunction getWebGLRenderingContext(webGLVersion: number):
WebGLRenderingContext {\n if (webGLVersion !== 1 && webGLVersion !== 2) {\n throw new Error('Cannot
get WebGL rendering context, WebGL is disabled.);\n }\n const canvas = createCanvas(webGLVersion);\n\n
canvas.addEventListener('webglcontextlost', (ev: Event) => {\n ev.preventDefault();\n delete
contexts[webGLVersion];\n }, false);\n if (webGLVersion === 1) {\n return (canvas.getContext('webgl',
WEBGL_ATTRIBUTES) ||\n canvas.getContext('experimental-webgl', WEBGL_ATTRIBUTES)) as\n

```

WebGLRenderingContext; } return canvas.getContext('webgl2', WebGL_ATTRIBUTES) as WebGLRenderingContext; }" / ** @license * Copyright 2017 Google LLC. All Rights Reserved. * Licensed under the Apache License, Version 2.0 (the "License"); * you may not use this file except in compliance with the License. * You may obtain a copy of the License at * http://www.apache.org/licenses/LICENSE-2.0 * Unless required by applicable law or agreed to in writing, software * distributed under the License is distributed on an "AS IS" BASIS, * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. * See the License for the specific language governing permissions and * limitations under the License. *

```

=====
*/
import { backend_util, DataId, DataType, env, TensorInfo, util } from '@tensorflow/tfjs-core';
export enum PackingScheme {
  /** All values in a single texel are densely packed without any constraints. This is how the shader encodes a tensor with shape = [2, 3, 4] (indices are [batch, row, col]). 000|001 010|011 020|021 * ----- ----- * 002|003 012|013 022|023 * 100|101 110|111 120|121 * ----- ----- * 102|103 112|113 122|123 * */
  DENSE,
  /** Single texels contain only values from the same batch, and from adjacent rows and columns. This is how the shader encodes a tensor with shape = [2, 3, 5] (indices are [batch, row, col]). 000|001 002|003 004|xxx 020|021 022|023 024|xxx * ----- ----- * 010|011 012|013 014|xxx xxx|xxx xxx|xxx xxx|xxx * 100|101 102|103 104|xxx 120|121 122|123 124|xxx * ----- - ----- * 110|111 112|113 114|xxx xxx|xxx xxx|xxx xxx|xxx */
  SHARED_BATCH,
}
export enum TextureUsage {
  RENDER,
  UPLOAD,
  PIXELS,
  DOWNLOAD,
}
export enum PhysicalTextureType {
  UNPACKED_FLOAT16,
  UNPACKED_FLOAT32,
  PACKED_4X1_UNSIGNED_BYTE,
  PACKED_2X2_FLOAT32,
  PACKED_2X2_FLOAT16,
}
export interface TextureData {
  // Required.
  shape: number[];
  dtype: DataType;
  // Optional.
  values?: backend_util.BackendValues;
  texture?: WebGLTexture;
  // For complex numbers, the real and imaginary parts are stored as their own individual tensorInfos, with a parent joining the two with the complexTensors field. When this is defined, texture will be null.
  complexTensorInfos?: {
    real: TensorInfo,
    imag: TensorInfo;
  };
  /** [rows, columns] shape of the texture. */
  texShape?: [number, number];
  usage?: TextureUsage;
  isPacked?: boolean;
  refCount: number;
  // Available when the tensor has been sliced.
  slice?: {
    // Offset in the 'flat index' space.
    flatOffset: number;
    // Used for counting how many sliced tensors point to the same texture.
    origDataId: DataId;
  };
}
export function getUnpackedMatrixTextureShapeWidthHeight(
  rows: number, columns: number): [number, number] {
  return [columns, rows];
}
export function getUnpackedArraySizeFromMatrixSize(
  matrixSize: number, channelsPerTexture: number): number {
  return matrixSize * channelsPerTexture;
}
export function getColorMatrixTextureShapeWidthHeight(
  rows: number, columns: number): [number, number] {
  return [columns * 4, rows];
}
/** Get shape for densely packed RGBA texture. */
export function getDenseTexShape(shape: number[]): [number, number] {
  const size = util.sizeFromShape(shape);
  const texelsNeeded = Math.ceil(size / 4);
  return util.sizeToSquarishShape(texelsNeeded);
}
export function getMatrixSizeFromUnpackedArraySize(
  unpackedSize: number, channelsPerTexture: number): number {
  if (unpackedSize % channelsPerTexture !== 0) {
    throw new Error(`unpackedSize (${unpackedSize}) must be a multiple of ${channelsPerTexture}`);
  }
  return unpackedSize / channelsPerTexture;
}
export function decodeMatrixFromUnpackedColorRGBAArray(
  unpackedArray: Float32Array, matrix: Float32Array, channels: number) {
  const requiredSize = unpackedArray.length * channels / 4;
  if (matrix.length < requiredSize) {
    throw new Error(`matrix length (${matrix.length}) must be >= ${requiredSize}`);
  }
  let dst = 0;
  for (let src = 0; src < unpackedArray.length; src += 4) {
    for (let c = 0; c < channels; c++) {
      matrix[dst++] = unpackedArray[src + c];
    }
  }
}
export function getPackedMatrixTextureShapeWidthHeight(
  rows: number, columns: number): [number, number] {
  return [
    Math.max(1, Math.ceil(columns / 2)),
    Math.max(1, Math.ceil(rows / 2))
  ];
}
export function getPackedRGBAArraySizeFromMatrixShape(
  rows: number, columns: number): number {
  const [w, h] =

```

```

getPackedMatrixTextureShapeWidthHeight(rows, columns);\n return w * h * 4;\n}\n\nexport interface
TextureConfig {\n internalFormatFloat: number;\n textureFormatFloat: number;\n
internalFormatPackedHalfFloat: number;\n internalFormatHalfFloat: number;\n internalFormatPackedFloat:
number;\n\n // The format to use during a gl.readPixels call.\n downloadTextureFormat: number;\n // How many
channels need to be unpacked after a gl.readPixels call.\n downloadUnpackNumChannels: number;\n\n
defaultNumChannels: number;\n textureTypeHalfFloat: number;\n textureTypeFloat: number;\n}\n\nexport
function getTextureConfig(\n // tslint:disable-next-line:no-any\n gl: WebGLRenderingContext,
textureHalfFloatExtension?: any): TextureConfig {\n // tslint:disable-next-line:no-any\n const glany = gl as
any;\n\n let internalFormatFloat: number;\n let internalFormatHalfFloat: number;\n let
internalFormatPackedHalfFloat: number;\n let internalFormatPackedFloat: number;\n let textureFormatFloat:
number;\n\n let downloadTextureFormat: number;\n let downloadUnpackNumChannels: number;\n let
defaultNumChannels: number;\n let textureTypeHalfFloat: number;\n let textureTypeFloat: number;\n if
(env().getNumber('WEBGL_VERSION') === 2) {\n internalFormatFloat = glany.R32F;\n
internalFormatHalfFloat = glany.R16F;\n internalFormatPackedHalfFloat = glany.RGBA16F;\n
internalFormatPackedFloat = glany.RGBA32F;\n textureFormatFloat = glany.RED;\n
downloadUnpackNumChannels = 4;\n defaultNumChannels = 1;\n textureTypeHalfFloat =
glany.HALF_FLOAT;\n textureTypeFloat = glany.FLOAT;\n } else {\n internalFormatFloat = gl.RGBA;\n
internalFormatHalfFloat = gl.RGBA;\n internalFormatPackedHalfFloat = gl.RGBA;\n
internalFormatPackedFloat = glany.RGBA;\n textureFormatFloat = gl.RGBA;\n
downloadUnpackNumChannels = 4;\n defaultNumChannels = 4;\n textureTypeHalfFloat = textureHalfFloatExtension != null ?\n
textureHalfFloatExtension.HALF_FLOAT_OES : null;\n textureTypeFloat = gl.FLOAT;\n }\n
downloadTextureFormat = gl.RGBA;\n\n return {\n internalFormatFloat,\n internalFormatHalfFloat,\n
internalFormatPackedHalfFloat,\n internalFormatPackedFloat,\n textureFormatFloat,\n
downloadTextureFormat,\n downloadUnpackNumChannels,\n defaultNumChannels,\n
textureTypeHalfFloat,\n textureTypeFloat\n };\n}\n\n/**\n * @license\n * Copyright 2017 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n\n
=====\n
*\n\nimport {env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext} from
'/canvas_util';\n\nimport {getTextureConfig} from './tex_util';\n\nexport function callAndCheck<T>(gl:
WebGLRenderingContext, func: () => T): T {\n const returnValue = func();\n if (env().getBool('DEBUG')) {\n
checkWebGLError(gl);\n }\n return returnValue;\n}\n\nfunction checkWebGLError(gl: WebGLRenderingContext)
{\n const error = gl.getError();\n if (error !== gl.NO_ERROR) {\n throw new Error('WebGL Error: ' +
getWebGLErrorMessage(gl, error));\n }\n}\n\n// https://en.wikipedia.org/wiki/Half-precision_floating-
point_format\n\nconst MIN_FLOAT16 = 5.96e-8;\n\nconst MAX_FLOAT16 = 65504;\n\nexport function
canBeRepresented(num: number): boolean {\n if (env().getBool('WEBGL_RENDER_FLOAT32_ENABLED') ||
num === 0 ||\n (MIN_FLOAT16 < Math.abs(num) && Math.abs(num) < MAX_FLOAT16)) {\n return true;\n
}\n return false;\n}\n\nexport function getWebGLErrorMessage(\n gl: WebGLRenderingContext, status: number):
string {\n switch (status) {\n case gl.NO_ERROR:\n return 'NO_ERROR';\n case gl.INVALID_ENUM:\n
return 'INVALID_ENUM';\n case gl.INVALID_VALUE:\n return 'INVALID_VALUE';\n case
gl.INVALID_OPERATION:\n return 'INVALID_OPERATION';\n case
gl.INVALID_FRAMEBUFFER_OPERATION:\n return 'INVALID_FRAMEBUFFER_OPERATION';\n case
gl.OUT_OF_MEMORY:\n return 'OUT_OF_MEMORY';\n case gl.CONTEXT_LOST_WEBGL:\n return
'CONTEXT_LOST_WEBGL';\n default:\n return `Unknown error code ${status}`;\n }\n}\n\nexport function

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getExtensionOrThrow(\n gl: WebGLRenderingContext, extensionName: string): {} {\n return
throwIfNull<{}>(\n gl, () => gl.getExtension(extensionName),\n 'Extension \'' + extensionName + '\'' not
supported on this browser.);\n}\n\nexport function createVertexShader(\n gl: WebGLRenderingContext,
vertexShaderSource: string): WebGLShader {\n const vertexShader: WebGLShader =
throwIfNull<WebGLShader>(\n gl, () => gl.createShader(gl.VERTEX_SHADER),\n 'Unable to create vertex
WebGLShader.);\n callAndCheck(gl, () => gl.shaderSource(vertexShader, vertexShaderSource));\n
callAndCheck(gl, () => gl.compileShader(vertexShader));\n if (gl.getShaderParameter(vertexShader,
gl.COMPILE_STATUS) === false) {\n console.log(gl.getShaderInfoLog(vertexShader));\n throw new
Error('Failed to compile vertex shader.);\n }\n return vertexShader;\n}\n\nexport function
createFragmentShader(\n gl: WebGLRenderingContext, fragmentShaderSource: string): WebGLShader {\n const
fragmentShader: WebGLShader = throwIfNull<WebGLShader>(\n gl, () =>
gl.createShader(gl.FRAGMENT_SHADER),\n 'Unable to create fragment WebGLShader.);\n callAndCheck(gl,
() => gl.shaderSource(fragmentShader, fragmentShaderSource));\n callAndCheck(gl, () =>
gl.compileShader(fragmentShader));\n if (gl.getShaderParameter(fragmentShader, gl.COMPILE_STATUS) ===
false) {\n logShaderSourceAndInfoLog(\n fragmentShaderSource, gl.getShaderInfoLog(fragmentShader));\n
throw new Error('Failed to compile fragment shader.);\n }\n return fragmentShader;\n}\n\nconst lineNumberRegex
= /ERROR: [0-9]+:([0-9]+)/g;\nfunction logShaderSourceAndInfoLog(\n shaderSource: string, shaderInfoLog:
string) {\n const lineNumberRegexResult = lineNumberRegex.exec(shaderInfoLog);\n if (lineNumberRegexResult
== null) {\n console.log(`Couldn't parse line number in error: ${shaderInfoLog}`);\n
console.log(shaderSource);\n return;\n }\n\n const lineNumber = +lineNumberRegexResult[1];\n\n const
shaderLines = shaderSource.split('\n');\n const pad = shaderLines.length.toString().length + 2;\n const
linesWithLineNumbers = shaderLines.map(\n (line, lineNumber) =>\n util.rightPad((lineNumber +
1).toString(), pad) + line);\n let maxLineLength = 0;\n for (let i = 0; i < linesWithLineNumbers.length; i++) {\n
maxLineLength = Math.max(linesWithLineNumbers[i].length, maxLineLength);\n }\n\n const beforeErrorLines =
linesWithLineNumbers.slice(0, lineNumber - 1);\n const errorLine = linesWithLineNumbers.slice(lineNumber - 1,
lineNumber);\n const afterErrorLines = linesWithLineNumbers.slice(lineNumber);\n\n
console.log(beforeErrorLines.join('\n'));\n console.log(shaderInfoLog.split('\n')[0]);\n console.log(\n `%c
${util.rightPad(errorLine[0], maxLineLength)}\n `,\n 'border: 1px solid red; background-color: #e3d2d2;
color: #a61717');\n console.log(afterErrorLines.join('\n'));\n}\n\nexport function createProgram(gl:
WebGLRenderingContext): WebGLProgram {\n return throwIfNull<WebGLProgram>(\n gl, () =>
gl.createProgram(), 'Unable to create WebGLProgram.);\n}\n\nexport function linkProgram(gl:
WebGLRenderingContext, program: WebGLProgram) {\n callAndCheck(gl, () => gl.linkProgram(program));\n if
(gl.getProgramParameter(program, gl.LINK_STATUS) === false) {\n
console.log(gl.getProgramInfoLog(program));\n throw new Error('Failed to link vertex and fragment shaders.);\n
}\n}\n\nexport function validateProgram(\n gl: WebGLRenderingContext, program: WebGLProgram) {\n
callAndCheck(gl, () => gl.validateProgram(program));\n if (gl.getProgramParameter(program,
gl.VALIDATE_STATUS) === false) {\n console.log(gl.getProgramInfoLog(program));\n throw new
Error('Shader program validation failed.);\n }\n}\n\nexport function createStaticVertexBuffer(\n gl:
WebGLRenderingContext, data: Float32Array): WebGLBuffer {\n const buffer: WebGLBuffer =
throwIfNull<WebGLBuffer>(\n gl, () => gl.createBuffer(), 'Unable to create WebGLBuffer');\n
callAndCheck(gl, () => gl.bindBuffer(gl.ARRAY_BUFFER, buffer));\n callAndCheck(gl, () =>
gl.bufferData(gl.ARRAY_BUFFER, data, gl.STATIC_DRAW));\n return buffer;\n}\n\nexport function
createStaticIndexBuffer(\n gl: WebGLRenderingContext, data: Uint16Array): WebGLBuffer {\n const buffer:
WebGLBuffer = throwIfNull<WebGLBuffer>(\n gl, () => gl.createBuffer(), 'Unable to create WebGLBuffer');\n
callAndCheck(gl, () => gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, buffer));\n callAndCheck(\n gl, () =>
gl.bufferData(gl.ELEMENT_ARRAY_BUFFER, data, gl.STATIC_DRAW));\n return buffer;\n}\n\nexport
function getNumChannels(): number {\n if (env().getNumber('WEBGL_VERSION') === 2) {\n return 1;\n }\n
return 4;\n}\n\nexport function createTexture(gl: WebGLRenderingContext): WebGLTexture {\n return

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throwIfNull<WebGLTexture>(\n    gl, () => gl.createTexture(), 'Unable to create WebGLTexture.');
```

\n\n\nexport function validateTextureSize(width: number, height: number) {\n const maxTextureSize = env().getNumber('WEBGL_MAX_TEXTURE_SIZE');

\n if ((width <= 0) || (height <= 0)) {\n const requested = `[\$ {width}x\${height}]`;\n throw new Error('Requested texture size ' + requested + ' is invalid.');

\n } \n if ((width > maxTextureSize) || (height > maxTextureSize)) {\n const requested = `[\$ {width}x\${height}]`;\n const max = `[\$ {maxTextureSize}x\${maxTextureSize}]`;\n throw new Error(\n 'Requested texture size ' + requested + \n ' greater than WebGL maximum on this browser / GPU ' + max + '.');

\n } \n} \n\n\nexport function createFramebuffer(gl: WebGLRenderingContext): WebGLFramebuffer {\n return throwIfNull<WebGLFramebuffer>(\n gl, () => gl.createFramebuffer(), 'Unable to create WebGLFramebuffer.');

\n} \n\n\nexport function bindVertexBufferToProgramAttribute(\n gl: WebGLRenderingContext, program: WebGLProgram, attribute: string, \n buffer: WebGLBuffer, arrayEntriesPerItem: number, itemStrideInBytes: number, \n itemOffsetInBytes: number): boolean {\n const loc = gl.getAttribLocation(program, attribute);\n if (loc === -1) {\n // The GPU compiler decided to strip out this attribute because it's unused, \n // thus no need to bind. \n return false;\n }\n callAndCheck(gl, () => gl.bindBuffer(gl.ARRAY_BUFFER, buffer));\n callAndCheck(\n gl, \n () => gl.vertexAttribPointer(\n loc, arrayEntriesPerItem, gl.FLOAT, false, itemStrideInBytes, \n itemOffsetInBytes));\n callAndCheck(gl, () => gl.enableVertexAttribArray(loc));\n return true;\n} \n\n\nexport function bindTextureUnit(\n gl: WebGLRenderingContext, texture: WebGLTexture, textureUnit: number) {\n validateTextureUnit(gl, textureUnit);\n callAndCheck(gl, () => gl.activeTexture(gl.TEXTURE0 + textureUnit));\n callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, texture));\n} \n\n\nexport function unbindTextureUnit(\n gl: WebGLRenderingContext, textureUnit: number) {\n validateTextureUnit(gl, textureUnit);\n callAndCheck(gl, () => gl.activeTexture(gl.TEXTURE0 + textureUnit));\n callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n} \n\n\nexport function getProgramUniformLocationOrThrow(\n gl: WebGLRenderingContext, program: WebGLProgram, \n uniformName: string): WebGLUniformLocation {\n return throwIfNull<WebGLUniformLocation>(\n gl, () => gl.getUniformLocation(program, uniformName), \n 'uniform \'' + uniformName + '\' not present in program.');

\n} \n\n\nexport function getProgramUniformLocation(\n gl: WebGLRenderingContext, program: WebGLProgram, \n uniformName: string): WebGLUniformLocation {\n return gl.getUniformLocation(program, uniformName);\n} \n\n\nexport function bindTextureToProgramUniformSampler(\n gl: WebGLRenderingContext, texture: WebGLTexture, \n uniformSamplerLocation: WebGLUniformLocation, textureUnit: number) {\n callAndCheck(gl, () => bindTextureUnit(gl, texture, textureUnit));\n callAndCheck(gl, () => gl.uniform1i(uniformSamplerLocation, textureUnit));\n} \n\n\nexport function bindCanvasToFramebuffer(gl: WebGLRenderingContext) {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, null));\n callAndCheck(gl, () => gl.viewport(0, 0, gl.canvas.width, gl.canvas.height));\n callAndCheck(gl, () => gl.scissor(0, 0, gl.canvas.width, gl.canvas.height));\n} \n\n\nexport function bindColorTextureToFramebuffer(\n gl: WebGLRenderingContext, texture: WebGLTexture, \n framebuffer: WebGLFramebuffer) {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer));\n callAndCheck(\n gl, \n () => gl.framebufferTexture2D(\n gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0));\n} \n\n\nexport function unbindColorTextureFromFramebuffer(\n gl: WebGLRenderingContext, framebuffer: WebGLFramebuffer) {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer));\n callAndCheck(\n gl, \n () => gl.framebufferTexture2D(\n gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, null, 0));\n} \n\n\nexport function validateFramebuffer(gl: WebGLRenderingContext) {\n const status = gl.checkFramebufferStatus(gl.FRAMEBUFFER);\n if (status !== gl.FRAMEBUFFER_COMPLETE) {\n throw new Error(\n 'Error binding framebuffer: ' + getFramebufferErrorMessage(gl, status));\n }\n} \n\n\nexport function getFramebufferErrorMessage(\n gl: WebGLRenderingContext, status: number): string {\n switch (status) {\n case gl.FRAMEBUFFER_INCOMPLETE_ATTACHMENT:\n return 'FRAMEBUFFER_INCOMPLETE_ATTACHMENT';\n case


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gl.FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT:\n  return
'FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT';\n  case
gl.FRAMEBUFFER_INCOMPLETE_DIMENSIONS:\n  return
'FRAMEBUFFER_INCOMPLETE_DIMENSIONS';\n  case gl.FRAMEBUFFER_UNSUPPORTED:\n  return
'FRAMEBUFFER_UNSUPPORTED';\n  default:\n  return `unknown error ${status}`;\n  }\n}\n\nfunction
throwIfNull<T>(\n  gl: WebGLRenderingContext, returnOrNull: () => T | null,\n  failureMessage: string): T {\n
const tOrNull: T | null = callAndCheck(gl, () => returnOrNull());\n  if (tOrNull === null) {\n    throw new
Error(failureMessage);\n  }\n  return tOrNull;\n}\n\nfunction validateTextureUnit(gl: WebGLRenderingContext,
textureUnit: number) {\n  const maxTextureUnit = gl.MAX_COMBINED_TEXTURE_IMAGE_UNITS - 1;\n  const glTextureUnit = textureUnit + gl.TEXTURE0;\n  if (glTextureUnit < gl.TEXTURE0 || glTextureUnit >
maxTextureUnit) {\n    const textureUnitRange = `[gl.TEXTURE0, gl.TEXTURE${maxTextureUnit}]`;\n    throw
new Error(`textureUnit must be in ${textureUnitRange}`);\n  }\n}\n\nexport function getBatchDim(shape:
number[], dimsToSkip = 2): number {\n  return util.sizeFromShape(shape.slice(0, shape.length -
dimsToSkip));\n}\n\nexport function getRowsCols(shape: number[]): [number, number] {\n  if (shape.length === 0)
{\n    throw Error('Cannot get rows and columns of an empty shape array.);\n  }\n  return [\n    shape.length > 1 ?
shape[shape.length - 2] : 1, shape[shape.length - 1]\n  ];\n}\n\nexport function getShapeAs3D(shape: number[]):
[number, number, number] {\n  let shapeAs3D: [number, number, number] = [1, 1, 1];\n  const isScalar =
shape.length === 0 || (shape.length === 1 && shape[0] === 1);\n  if (!isScalar) {\n    shapeAs3D =\n    [getBatchDim(shape), ...getRowsCols(shape)] as [number, number, number];\n  }\n  return
shapeAs3D;\n}\n\nexport function getTextureShapeFromLogicalShape(\n  logShape: number[], isPacked = false):
[number, number] {\n  let maxTexSize = env().getNumber('WEBGL_MAX_TEXTURE_SIZE');\n  if (isPacked) {\n
maxTexSize = maxTexSize * 2;\n    // This logic ensures we accurately count the number of packed texels
needed\n    // to accommodate the tensor. We can only pack values in the same texel if\n    // they are from adjacent
pairs of rows/cols within the same batch. So if a\n    // tensor has 3 rows, we pretend it has 4 rows in order to account
for the\n    // fact that the texels containing the third row are half empty.\n    logShape = logShape.map(\n      (d, i)
=> i >= logShape.length - 2 ?\n        util.nearestLargerEven(logShape[i]) :\n        logShape[i]);\n    // Packed
texture height is at least 2 (the channel height of a single\n    // texel).\n    if (logShape.length === 1) {\n
logShape = [2, logShape[0]];\n    }\n    // If logical shape is 2, we don't squeeze, since we want to match
physical.\n    if (logShape.length !== 2) {\n      const squeezeResult = util.squeezeShape(logShape);\n      logShape =
squeezeResult.newShape;\n    }\n    let size = util.sizeFromShape(logShape);\n    if (logShape.length <= 1 && size <=
maxTexSize) {\n      return [1, size];\n    } else if (\n      logShape.length === 2 && logShape[0] <= maxTexSize &&\n
logShape[1] <= maxTexSize) {\n      return logShape as [number, number];\n    } else if (\n      logShape.length ===
3 && logShape[0] * logShape[1] <= maxTexSize &&\n      logShape[2] <= maxTexSize) {\n      return [logShape[0]
* logShape[1], logShape[2]];\n    } else if (\n      logShape.length === 3 && logShape[0] <= maxTexSize &&\n
logShape[1] * logShape[2] <= maxTexSize) {\n      return [logShape[0], logShape[1] * logShape[2]];\n    } else if (\n
logShape.length === 4 &&\n      logShape[0] * logShape[1] * logShape[2] <= maxTexSize &&\n      logShape[3]
<= maxTexSize) {\n      return [logShape[0] * logShape[1] * logShape[2], logShape[3]];\n    } else if (\n
logShape.length === 4 && logShape[0] <= maxTexSize &&\n      logShape[1] * logShape[2] * logShape[3] <=
maxTexSize) {\n      return [logShape[0], logShape[1] * logShape[2] * logShape[3]];\n    } else {\n      if (isPacked) {\n
// For packed textures size equals the number of channels required to\n      // accommodate the texture data.
However in order to squarify such that\n      // inner dimensions stay even, we rewrite size to equal the number of\n
// texels. Then in the return statement we rehydrate the squarified\n      // dimensions to channel units.\n      const
batchDim = getBatchDim(logShape);\n      let rows = 2, cols = 2;\n      if (logShape.length) {\n        [rows, cols] =
getRowsCols(logShape);\n      }\n      size = batchDim * (rows / 2) * (cols / 2);\n      return
util.sizeToSquarishShape(size).map(d => d * 2) as [number, number];\n    }\n    return
util.sizeToSquarishShape(size);\n  }\n}\n\nfunction isEven(n: number): boolean {\n  return n % 2 ===
0;\n}\n\n/**\n * This determines whether reshaping a packed texture requires rearranging\n * the data within the
texture, assuming 2x2 packing.\n */\nexport function isReshapeFree(shape1: number[], shape2: number[]): boolean

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{\n shape1 = shape1.slice(-2);\n shape2 = shape2.slice(-2);\n\n if (util.arraysEqual(shape1, shape2)) {\n return
true;\n }\n\n if (!shape1.length || !shape2.length) { // One of the shapes is a scalar.\n return true;\n }\n\n if
(shape1[0] === 0 || shape1[1] === 0 || shape2[0] === 0 ||\n shape2[1] === 0) {\n return true;\n }\n\n if
(shape1.length !== shape2.length) { // One of the shapes is a vector.\n const shape1Cols = shape1.slice(-1)[0];\n
const shape2Cols = shape2.slice(-1)[0];\n if (shape1Cols === shape2Cols) {\n return true;\n }\n\n if
(isEven(shape1Cols) && isEven(shape2Cols) &&\n (shape1[0] === 1 || shape2[0] === 1)) {\n return true;\n
}\n }\n return shape1[1] === shape2[1] && isEven(shape1[0]) && isEven(shape2[0]);\n}\n\n// We cache webgl
params because the environment gets reset between\n// unit tests and we don't want to constantly query the
WebGLContext for\n// MAX_TEXTURE_SIZE.\nlet MAX_TEXTURE_SIZE: number;\nlet
MAX_TEXTURES_IN_SHADER: number;\n\nexport function getWebGLMaxTextureSize(webGLVersion:
number): number {\n if (MAX_TEXTURE_SIZE === null) {\n const gl = getWebGLContext(webGLVersion);\n
MAX_TEXTURE_SIZE = gl.getParameter(gl.MAX_TEXTURE_SIZE);\n }\n return
MAX_TEXTURE_SIZE;\n}\n\nexport function resetMaxTextureSize() {\n MAX_TEXTURE_SIZE =
null;\n}\n\nexport function resetMaxTexturesInShader() {\n MAX_TEXTURES_IN_SHADER = null;\n}\n\nexport
function getMaxTexturesInShader(webGLVersion: number): number {\n if (MAX_TEXTURES_IN_SHADER ===
null) {\n const gl = getWebGLContext(webGLVersion);\n MAX_TEXTURES_IN_SHADER =
gl.getParameter(gl.MAX_TEXTURE_IMAGE_UNITS);\n }\n // We cap at 16 to avoid spurious runtime \"memory
exhausted\" error.\n return Math.min(16, MAX_TEXTURES_IN_SHADER);\n}\n\nexport function
getWebGLDisjointQueryTimerVersion(webGLVersion: number): number {\n if (webGLVersion === 0) {\n
return 0;\n }\n\n let queryTimerVersion: number;\n const gl = getWebGLContext(webGLVersion);\n\n if
(hasExtension(gl, 'EXT_disjoint_timer_query_webgl2') &&\n webGLVersion === 2) {\n queryTimerVersion =
2;\n } else if (hasExtension(gl, 'EXT_disjoint_timer_query')) {\n queryTimerVersion = 1;\n } else {\n
queryTimerVersion = 0;\n }\n return queryTimerVersion;\n}\n\nexport function hasExtension(gl:
WebGLRenderingContext, extensionName: string) {\n const ext = gl.getExtension(extensionName);\n return ext !=
null;\n}\n\nexport function isWebGLVersionEnabled(webGLVersion: 1|2) {\n try {\n const gl =
getWebGLContext(webGLVersion);\n if (gl != null) {\n return true;\n }\n } catch (e) {\n console.log('Error
when getting WebGL context: ', e);\n return false;\n }\n return false;\n}\n\nexport function
isCapableOfRenderingToFloatTexture(webGLVersion: number): boolean {\n if (webGLVersion === 0) {\n
return false;\n }\n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if
(!hasExtension(gl, 'OES_texture_float')) {\n return false;\n }\n } else {\n if (!hasExtension(gl,
'EXT_color_buffer_float')) {\n return false;\n }\n }\n\n const isFrameBufferComplete =
createFloatTextureAndBindToFramebuffer(gl);\n return isFrameBufferComplete;\n}\n\n/**\n * Check if we can
download values from a float/half-float texture.\n *\n * Note that for performance reasons we use binding a texture
to a framebuffer\n * as a proxy for ability to download float values later using readPixels. The\n * texture params of
this texture will not match those in readPixels exactly\n * but if we are unable to bind some kind of float texture to
the framebuffer\n * then we definitely will not be able to read float values from it.\n */\nexport function
isDownloadFloatTextureEnabled(webGLVersion: number): boolean {\n if (webGLVersion === 0) {\n return
false;\n }\n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if
(!hasExtension(gl, 'OES_texture_float')) {\n return false;\n }\n if (!hasExtension(gl,
'WEBGL_color_buffer_float')) {\n return false;\n }\n } else {\n if (hasExtension(gl,
'EXT_color_buffer_float')) {\n return createFloatTextureAndBindToFramebuffer(gl);\n }\n\n const
COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n if (hasExtension(gl,
COLOR_BUFFER_HALF_FLOAT)) {\n const textureHalfFloatExtension =\n
gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\n return
createHalfFloatTextureAndBindToFramebuffer(\n gl, textureHalfFloatExtension);\n }\n\n return false;\n
}\n\n const isFrameBufferComplete = createFloatTextureAndBindToFramebuffer(gl);\n return
isFrameBufferComplete;\n}\n\nfunction createFloatTextureAndBindToFramebuffer(gl:
WebGLRenderingContext): boolean {\n const texConfig = getTextureConfig(gl);\n\n const texture =

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gl.createTexture();\n gl.bindTexture(gl.TEXTURE_2D, texture);\n\n const width = 1;\n const height = 1;\n
gl.texImage2D(\n  gl.TEXTURE_2D, 0, texConfig.internalFormatFloat, width, height, 0,\n
texConfig.textureFormatFloat, texConfig.textureTypeFloat, null);\n\n const framebuffer =
gl.createFramebuffer();\n gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer);\n gl.framebufferTexture2D(\n
gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n const
isFramebufferComplete =\n  gl.checkFramebufferStatus(gl.FRAMEBUFFER) ===
gl.FRAMEBUFFER_COMPLETE;\n\n gl.bindTexture(gl.TEXTURE_2D, null);\n
gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n gl.deleteTexture(texture);\n
gl.deleteFramebuffer(framebuffer);\n\n return isFramebufferComplete;\n}\n\nfunction
createHalfFloatTextureAndBindToFramebuffer(\n // tslint:disable-next-line:no-any\n gl:
WebGLRenderingContext, textureHalfFloatExtension: any): boolean {\n  const texConfig = getTextureConfig(gl,
textureHalfFloatExtension);\n  const texture = gl.createTexture();\n  gl.bindTexture(gl.TEXTURE_2D, texture);\n\n
const width = 1;\n  const height = 1;\n  gl.texImage2D(\n    gl.TEXTURE_2D, 0,
texConfig.internalFormatHalfFloat, width, height, 0,\n    texConfig.textureFormatFloat,
texConfig.textureTypeHalfFloat, null);\n\n  const framebuffer = gl.createFramebuffer();\n
gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer);\n  gl.framebufferTexture2D(\n    gl.FRAMEBUFFER,
gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n  const isFramebufferComplete =\n
gl.checkFramebufferStatus(gl.FRAMEBUFFER) === gl.FRAMEBUFFER_COMPLETE;\n\n
gl.bindTexture(gl.TEXTURE_2D, null);\n  gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n
gl.deleteTexture(texture);\n  gl.deleteFramebuffer(framebuffer);\n\n  return isFramebufferComplete;\n}\n\nexport
function isWebGLFenceEnabled(webGLVersion: number) {\n  if (webGLVersion !== 2) {\n    return false;\n  }\n
const gl = getWebGLContext(webGLVersion);\n\n // tslint:disable-next-line:no-any\n  const isEnabled = (gl as
any).fenceSync != null;\n  return isEnabled;\n}\n\nexport function assertNotComplex(\n  tensor:
TensorInfo|TensorInfo[], opName: string): void {\n  if (!Array.isArray(tensor)) {\n    tensor = [tensor];\n  }\n
tensor.forEach(t => {\n  if (t != null) {\n    util.assert(\n      t.dtype !== 'complex64',\n      () => `${opName}
does not support complex64 tensors` +\n      '\n      'in the WebGL backend.);\n    }\n  });\n}\n\n"/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {device_util, env} from '@tensorflow/tfjs-core';\n\nimport {getMaxTexturesInShader,
getWebGLDisjointQueryTimerVersion, getWebGLMaxTextureSize, isCapableOfRenderingToFloatTexture,
isDownloadFloatTextureEnabled, isWebGLFenceEnabled, isWebGLVersionEnabled} from './webgl_util';\n\nconst
ENV = env();\n\n/**\n * This file contains WebGL-specific flag registrations.\n *\n\n**\n * True if WebGL is
supported.\n *\n\nENV.registerFlag('HAS_WEBGL', () => ENV.getNumber('WEBGL_VERSION') > 0);\n\n**\n 0:
No WebGL, 1: WebGL 1.0, 2: WebGL 2.0. *\n\nENV.registerFlag('WEBGL_VERSION', () => {\n  if
(isWebGLVersionEnabled(2)) {\n    return 2;\n  } else if (isWebGLVersionEnabled(1)) {\n    return 1;\n  }\n
return 0;\n});\n\n** Whether to check for numerical representation problems.
*\n\nENV.registerFlag('WEBGL_CHECK_NUMERICAL_PROBLEMS', () => false);\n\nENV.registerFlag(\n
'WEBGL_BUFFER_SUPPORTED', () => ENV.get('WEBGL_VERSION') === 2);\n\n** Whether the WebGL
backend will sometimes forward ops to the CPU. *\n\nENV.registerFlag('WEBGL_CPU_FORWARD', () =>
true);\n\n** Whether the WebGL backend will always use f16 textures for rendering.
*\n\nENV.registerFlag('WEBGL_FORCE_F16_TEXTURES', () => false);\n\n** Whether to turn all packing related
flags on. *\n\nENV.registerFlag('WEBGL_PACK', () => ENV.getBool('HAS_WEBGL'));\n\n** Whether we will
pack the batchnormalization op. *\n\nENV.registerFlag('WEBGL_PACK_NORMALIZATION', () =>

```

```

ENV.getBool('WEBGL_PACK'));
/** Whether we will pack the clip op.
 *
 * ENV.registerFlag('WEBGL_PACK_CLIP', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will pack the depthwise conv op.
 * // TODO:
 * https://github.com/tensorflow/tfjs/issues/1679
 * ENV.registerFlag('WEBGL_PACK_DEPTHWISECONV', () => false);
 * Whether we will pack binary ops.
 * ENV.registerFlag('WEBGL_PACK_BINARY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will pack unary ops.
 * ENV.registerFlag('WEBGL_PACK_UNARY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will pack array ops.
 * ENV.registerFlag('WEBGL_PACK_ARRAY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will pack image ops.
 * ENV.registerFlag('WEBGL_PACK_IMAGE_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will pack reduce ops.
 * ENV.registerFlag('WEBGL_PACK_REDUCE', () => ENV.getBool('WEBGL_PACK'));
 * Whether packed WebGL kernels lazily unpack their outputs.
 * ENV.registerFlag('WEBGL_LAZILY_UNPACK', () => ENV.getBool('WEBGL_PACK'));
 * Whether we will use the im2col algorithm to speed up convolutions.
 * ENV.registerFlag('WEBGL_CONV_IM2COL', () => ENV.getBool('WEBGL_PACK'));
 * The maximum texture dimension.
 * ENV.registerFlag('WEBGL_MAX_TEXTURE_SIZE', () => getWebGLMaxTextureSize(ENV.getNumber('WEBGL_VERSION')));
 * The maximum texture dimension.
 * ENV.registerFlag('WEBGL_MAX_TEXTURES_IN_SHADER', () => getMaxTexturesInShader(ENV.getNumber('WEBGL_VERSION')));
 * The disjoint_query_timer extension version.
 * 0: disabled, 1: EXT_disjoint_timer_query, 2: EXT_disjoint_timer_query_webgl2.
 * In Firefox with WebGL 2.0, EXT_disjoint_timer_query_webgl2 is not available, so we must use the WebGL 1.0 extension.
 * ENV.registerFlag('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION', () => {
 *   const webGLVersion = ENV.getNumber('WEBGL_VERSION');
 *   if (webGLVersion === 0) {
 *     return 0;
 *   }
 *   return getWebGLDisjointQueryTimerVersion(webGLVersion);
 * });
 * Whether the timer object from the disjoint_query_timer extension gives timing information that is reliable.
 * ENV.registerFlag('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE', () => ENV.getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0 && !device_util.isMobile());
 * Whether the device is physically capable of rendering to float32 textures.
 * ENV.registerFlag('WEBGL_RENDER_FLOAT32_CAPABLE', () => isCapableOfRenderingToFloatTexture(ENV.getNumber('WEBGL_VERSION')));
 * Whether rendering to float32 textures is enabled. If disabled, renders to float16 textures.
 * ENV.registerFlag('WEBGL_RENDER_FLOAT32_ENABLED', () => {
 *   return ENV.getBool('WEBGL_FORCE_F16_TEXTURES') ? false : ENV.getBool('WEBGL_RENDER_FLOAT32_CAPABLE');
 * });
 * Whether downloading float textures is enabled (16 or 32 bit). If disabled, uses IEEE 754 encoding of the float32 values to 4 uint8 when downloading.
 * ENV.registerFlag('WEBGL_DOWNLOAD_FLOAT_ENABLED', () => isDownloadFloatTextureEnabled(ENV.getNumber('WEBGL_VERSION')));
 * Whether the fence API is available.
 * ENV.registerFlag('WEBGL_FENCE_API_ENABLED', () => isWebGLFenceEnabled(ENV.getNumber('WEBGL_VERSION')));
 * Tensors with size <= than this will be uploaded as uniforms, not textures.
 * ENV.registerFlag('WEBGL_SIZE_UPLOAD_UNIFORM', () => {
 *   // Use uniform uploads only when 32bit floats are supported. In 16bit environments there are problems with comparing a 16bit texture value with a 32bit uniform value.
 *   const useUniforms = ENV.getBool('WEBGL_RENDER_FLOAT32_ENABLED');
 *   return useUniforms ? 4 : 0;
 * });
 * If the total number of bytes allocated on the GPU is greater than this number, we will aggressively delete textures upon disposal with gl.deleteMatrixTexture, rather than making them available for reuse.
 * Default value -1 indicates that we will never aggressively delete textures.
 * ENV.registerFlag('WEBGL_DELETE_TEXTURE_THRESHOLD', () => {
 *   return -1;
 * }, threshold => {
 *   if (threshold < 0 && threshold !== -1) {
 *     throw new Error(

```

`WEBGL_DELETE_TEXTURE_THRESHOLD` must be -1 (indicating never delete) or at least 0, but got `{threshold}`);
 }
 }
 "/*
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 * limitations under the License.

```

=====
import {env} from '@tensorflow/tfjs-core';
export type GLSL = {
  version: string,
  attribute: string,
  varyingVs: string,
  varyingFs: string,
  texture2D: string,
  output: string,
  defineOutput: string,
  defineSpecialNaN: string,
  defineSpecialInf: string,
  defineRound: string
};
export function
getGlsDifferences(): GLSL {
  let version: string;
  let attribute: string;
  let varyingVs: string;
  let varyingFs: string;
  let texture2D: string;
  let output: string;
  let defineOutput: string;
  let defineSpecialNaN: string;
  let defineSpecialInf: string;
  let defineRound: string;
  if (env().getNumber('WEBGL_VERSION') === 2) {
    version = '#version 300 es';
    attribute = 'in';
    varyingVs = 'out';
    varyingFs = 'in';
    texture2D = 'texture';
    output = 'outputColor';
    defineOutput = 'out vec4 outputColor';
    // Use custom isnan definition to work
    // across differences between
    // implementations on various platforms. While this should happen in ANGLE
    // we still see differences between android and windows (on chrome) when
    // using isnan directly.
    defineSpecialNaN = `
      bool isnan_custom(float val) {
        return (val > 0.0 || val < 0.0) ? false : val != 0.0;
      }
      bvec4 isnan_custom(vec4 val) {
        return bvec4(isnan_custom(val.x),
          isnan_custom(val.y),
          isnan_custom(val.z), isnan_custom(val.w));
      }
      #define isnan(value) isnan_custom(value)
    `;
    // In
    // webgl 2 we do not need to specify a custom isinf so there is no
    // need for a special INFINITY constant.
    defineSpecialInf = `
      #define round(value) newRound(value)
      int newRound(float
        value) {
        return int(floor(value + 0.5));
      }
      ivec4 newRound(vec4 value) {
        return
          ivec4(floor(value + vec4(0.5)));
      }
    `;
  } else {
    version = "";
    attribute = 'attribute';
    varyingVs = 'varying';
    varyingFs = 'varying';
    texture2D = 'texture2D';
    output = 'gl_FragColor';
    defineOutput = "";
    // WebGL1 has no built in isnan so we define one here.
    defineSpecialNaN = `
      #define isnan(value)
      isnan_custom(value)
      bool isnan_custom(float val) {
        return (val > 0. || val < 1. || val == 0.) ? false : true;
      }
      bvec4 isnan_custom(vec4 val) {
        return bvec4(isnan(val.x), isnan(val.y), isnan(val.z),
          isnan(val.w));
      }
    `;
    defineSpecialInf = `
      uniform float INFINITY;
      bool isinf(float val) {
        return abs(val) == INFINITY;
      }
      bvec4 isinf(vec4 val) {
        return equal(abs(val), vec4(INFINITY));
      }
    `;
    defineRound = `
      int round(float value) {
        return int(floor(value + 0.5));
      }
      ivec4
      round(vec4 value) {
        return ivec4(floor(value + vec4(0.5)));
      }
    `;
  }
  return {
    version,
    attribute,
    varyingVs,
    varyingFs,
    texture2D,
    output,
    defineOutput,
    defineSpecialNaN,
    defineSpecialInf,
    defineRound
  };
}
/*
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 * WITHOUT WARRANTIES
 * OR CONDITIONS OF ANY KIND, either express or implied.
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 * governing permissions and
 * limitations under the License.
  
```

```

=====
import {util} from '@tensorflow/tfjs-core';
/*
 * Produces GLSL code that derives logical coordinates
 * from a flat
 * index. The code performs integer division with each stride and decrements
 * the index until the
 * index equals the final dimension coordinate.
 */
export function getLogicalCoordinatesFromFlatIndex(
  coords: string[], shape: number[], index = 'index'): string {
  const strides = util.computeStrides(shape);
  return
  strides
    .map((stride, i) => {
      const line1 = `int ${coords[i]} = ${index} / ${stride}`;
      const line2 = i
    })
  }

```


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```
=====\n
*\n\nimport {getGlsIDifferences} from './gls_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport *\n as shader_util from './shader_compiler_util';\nimport {getDenseTexShape, PackingScheme} from\n './tex_util';\n\nexport class DecodeMatrixPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: [number, number, number];\n  outPackingScheme = PackingScheme.DENSE;\n\n  constructor(outputShape: [number, number, number]) {\n    const texShape = getDenseTexShape(outputShape);\n    const glsl = getGlsIDifferences();\n    this.outputShape =\n    outputShape;\n\n    this.userCode = `\n      ivec3 outCoordsFromFlatIndex(int index) {\n        ${\n        shader_util.getLogicalCoordinatesFromFlatIndex(\n          [r', 'c', 'd'], outputShape)}\n        return ivec3(r, c, d);\n      }\n\n      void main() {\n        ivec2 resTexRC = ivec2(resultUV.yx * \n          vec2(${texShape[0]},\n          ${texShape[1]}));\n        int index = 4 * (resTexRC.x * ${texShape[1]} + resTexRC.y);\n        vec4 result =\n        vec4(0.);\n        for (int i=0; i<4; i++) {\n          int flatIndex = index + i;\n          ivec3 rc =\n          outCoordsFromFlatIndex(flatIndex);\n          result[i] = getChannel(getA(rc.x, rc.y, rc.z), vec2(rc.y, rc.z));\n        }\n        ${glsl.output} = result;\n      }\n    `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

```

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```
=====\n
*\n\nimport {getGlsIDifferences} from './gls_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport\n {ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport\n class EncodeFloatProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n  outputShape: number[];\n  outTexUsage = TextureUsage.DOWNLOAD;\n\n  constructor(outputShape: number[])\n  {\n    const glsl = getGlsIDifferences();\n    this.outputShape = outputShape;\n    this.userCode = `\n    ${ENCODE_FLOAT_SNIPPET}\n\n    void main() {\n      float x = getAAtOutCoords();\n      ${glsl.output} =\n      encode_float(x);\n    }\n  `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *\n *

```

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```
=====\n
*\n\nimport {getGlsIDifferences} from './gls_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport\n {ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport\n class EncodeFloatPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  userCode: string;\n  outputShape: number[];\n  packedInputs = true;\n  packedOutput = false;\n  outTexUsage =\n  TextureUsage.DOWNLOAD;\n\n  constructor(outputShape: [number, number, number]) {\n    const glsl =\n    getGlsIDifferences();\n    this.outputShape = outputShape;\n    this.userCode = `\n    ${ENCODE_FLOAT_SNIPPET}\n\n    void main() {\n      ivec3 coords = getOutputCoords();\n      float x =\n      getChannel(getAAtOutCoords(), vec2(coords.y, coords.z));\n      ${glsl.output} = encode_float(x);\n    }\n  `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache

```

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```

=====
*/\n\nimport {getGslDifferences} from './gsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport *
as shader_util from './shader_compiler_util';\n\nexport class EncodeMatrixProgram implements GPGPUProgram {\n
variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(\n   outputShape: [number,
number, number], texShape: [number, number],\n   inputIsUnsignedByte = false) {\n   const gsl =
getGslDifferences();\n   const [height, width] = texShape;\n   this.outputShape = outputShape;\n\n   let output =
`result`;\n   if (inputIsUnsignedByte) {\n     output = `floor(result * 255. + 0.5)`;\n   }\n\n   this.userCode = `\n
${shader_util.getFlatIndexFrom3D(outputShape)}\n\n   void main() {\n     ivec3 coords =
getOutputCoords();\n\n     int flatIndex = getFlatIndex(coords);\n     int offset = imod(flatIndex, 4);\n\n
flatIndex = idiv(flatIndex, 4, 1.);\n     int r = flatIndex / ${width};\n     int c = imod(flatIndex, ${width});\n
vec2 uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n     vec4 values = ${gsl.texture2D}(A, uv);\n\n
float result;\n\n     if(offset == 0) {\n       result = values[0];\n     } else if(offset == 1) {\n       result =
values[1];\n     } else if(offset == 2) {\n       result = values[2];\n     } else {\n       result = values[3];\n
}\n\n     ${gsl.output} = vec4(${output}, 0., 0., 0.); \n     `;\n   }\n}\n\n"/**\n * @license\n * Copyright 2018
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*/\n\nimport {getGslDifferences} from './gsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport *
as shader_util from './shader_compiler_util';\n\n/*\n * This is how the shader encodes a tensor with shape = [2, 3,
5]\n * (indices are [batch, row, col]).\n * 000|001 002|003 004|xxx 020|021 022|023 024|xxx\n * -----
----- ----\n * --- ----- ----- ----\n * \n010|011 012|013 014|xxx xxx|xxx xxx|xxx xxx|xxx\n * \n100|101 102|103 104|xxx
120|121 122|123 124|xxx\n * ----- ----- ----- ----\n * ----- ----\n * \n110|111 112|113 114|xxx xxx|xxx
xxx|xxx\n * \n * Single texels contain only values from the same batch, and from adjacent rows\n * and
columns.\n * \n\nexport class EncodeMatrixPackedProgram implements GPGPUProgram {\n variableNames =
['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = false;\n packedOutput = true;\n\n
constructor(\n   outputShape: [number, number, number], texShape: [number, number],\n   inputIsUnsignedByte
= false) {\n   const gsl = getGslDifferences();\n   const [height, width] = texShape;\n   this.outputShape =
outputShape;\n\n   let mainLoop = ";\n   let output = 'result';\n   if (inputIsUnsignedByte) {\n     output =
'floor(result * 255. + 0.5)';\n   }\n\n   for (let row = 0; row <= 1; row++) {\n     for (let col = 0; col <= 1; col++) {\n
\n       const channel = row * 2 + col;\n       mainLoop += `\n         localCoords = coords;\n         if(localCoords[2] +
${col} < ${outputShape[2]}) {\n           localCoords[2] += ${col};\n           if(localCoords[1] + ${row} <
${outputShape[1]}) {\n             localCoords[1] += ${row};\n\n             flatIndex = getFlatIndex(localCoords);\n
\n             offset = imod(flatIndex, 4);\n\n             flatIndex = idiv(flatIndex, 4, 1.); \n             r = flatIndex / ${width};\n
\n             c = imod(flatIndex, ${width});\n             uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n
\n             values = ${gsl.texture2D}(A, uv);\n\n             if(offset == 0) {\n               result[${channel}] = values[0];\n
\n             } else if(offset == 1) {\n               result[${channel}] = values[1];\n             } else if(offset == 2) {\n
\n               result[${channel}] = values[2];\n             } else {\n               result[${channel}] = values[3];\n
\n             }\n\n             }\n\n             `;\n           }\n         }\n\n       }\n\n     }\n\n   }\n\n   this.userCode = `\n
${shader_util.getFlatIndexFrom3D(outputShape)}\n\n   void main() {\n     ivec3 coords = getOutputCoords();\n     vec4 result = vec4(0.); \n     int flatIndex, r, c,

```



```

offset;\n    ivec3 localCoords;\n    vec2 uv;\n    vec4 values;\n\n    ${mainLoop}\n\n    ${glsl.output} =
${output};\n    }\n    `;\n    }\n}\n", "/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {PixelData, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {getGlsIDifferences} from
'./glsl_version';\nimport * as tex_util from './tex_util';\nimport {TextureConfig} from './tex_util';\nimport * as
webgl_util from './webgl_util';\n\nexport function createVertexShader(gl: WebGLRenderingContext):
WebGLShader {\n  const glsl = getGlsIDifferences();\n  const vertexShaderSource = `${glsl.version}\n  precision
highp float;\n  ${glsl.attribute} vec3 clipSpacePos;\n  ${glsl.attribute} vec2 uv;\n  ${glsl.varyingVs} vec2
resultUV;\n\n  void main() {\n    gl_Position = vec4(clipSpacePos, 1);\n    resultUV = uv;\n  };\n  return
webgl_util.createVertexShader(gl, vertexShaderSource);\n}\n\nexport function createVertexBuffer(gl:
WebGLRenderingContext): WebGLBuffer {\n  // [x y z u v] * [upper-left, lower-left, upper-right, lower-right]\n
const vertexArray = new Float32Array([\n    -1, 1, 0, 0, 1, -1, -1, 0, 0, 0, 1, 1, 0, 1, 1, 1, -1, 0, 1, 0]);\n
return webgl_util.createStaticVertexBuffer(gl, vertexArray);\n}\n\nexport function createIndexBuffer(gl:
WebGLRenderingContext): WebGLBuffer {\n  // OpenGL (and WebGL) have \"CCW == front\" winding\n  const
triangleVertexIndices = new Uint16Array([0, 1, 2, 2, 1, 3]);\n  return webgl_util.createStaticIndexBuffer(gl,
triangleVertexIndices);\n}\n\nfunction createAndConfigureTexture(\n  gl: WebGLRenderingContext, width:
number, height: number,\n  internalFormat: number, textureFormat: number,\n  textureType: number):
WebGLTexture {\n  webgl_util.validateTextureSize(width, height);\n  const texture =
webgl_util.createTexture(gl);\n\n  const tex2d = gl.TEXTURE_2D;\n  webgl_util.callAndCheck(gl, () =>
gl.bindTexture(tex2d, texture));\n  webgl_util.callAndCheck(\n    gl, () => gl.texParameteri(tex2d,
gl.TEXTURE_WRAP_S, gl.CLAMP_TO_EDGE));\n  webgl_util.callAndCheck(\n    gl, () =>
gl.texParameteri(tex2d, gl.TEXTURE_WRAP_T, gl.CLAMP_TO_EDGE));\n  webgl_util.callAndCheck(\n    gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MIN_FILTER, gl.NEAREST));\n  webgl_util.callAndCheck(\n    gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MAG_FILTER, gl.NEAREST));\n  webgl_util.callAndCheck(\n    gl,\n    () => gl.texImage2D(\n      tex2d, 0, internalFormat, width, height, 0, textureFormat,\n      textureType,
null));\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n  return
texture;\n}\n\nexport function getInternalFormatForFloat32MatrixTexture(\n  textureConfig: TextureConfig) {\n
return textureConfig.internalFormatFloat;\n}\n\nexport function createFloat32MatrixTexture(\n  gl:
WebGLRenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n  tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n    gl, width, height,\n    getInternalFormatForFloat32MatrixTexture(textureConfig),\n    textureConfig.textureFormatFloat,
gl.FLOAT);\n}\n\nexport function getInternalFormatForFloat16MatrixTexture(\n  textureConfig: TextureConfig)
{\n  return textureConfig.internalFormatHalfFloat;\n}\n\nexport function createFloat16MatrixTexture(\n  gl:
WebGLRenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n  tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n    gl, width, height,\n    getInternalFormatForFloat16MatrixTexture(textureConfig),\n    textureConfig.textureFormatFloat,
textureConfig.textureTypeHalfFloat);\n}\n\nexport function getInternalFormatForUnsignedBytesMatrixTexture(\n
textureConfig: TextureConfig) {\n  return textureConfig.downloadTextureFormat;\n}\n\nexport function
createUnsignedBytesMatrixTexture(\n  gl: WebGLRenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLTexture {\n  const [width, height] =\n

```

```

tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n return createAndConfigureTexture(\n
gl, width, height,\n  getInternalFormatForUnsignedBytesMatrixTexture(textureConfig), gl.RGBA,\n
gl.UNSIGNED_BYTE);\n}\n\nexport function getInternalFormatForPackedMatrixTexture(\n  textureConfig:
TextureConfig) {\n return textureConfig.internalFormatPackedFloat;\n}\n\nexport function
createPackedMatrixTexture(\n  gl: WebGLRenderingContext, rows: number, columns: number,\n  textureConfig:
TextureConfig): WebGLTexture {\n  const [width, height] =\n
tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n  return createAndConfigureTexture(\n  gl,
width, height, getInternalFormatForPackedMatrixTexture(textureConfig),\n  gl.RGBA, gl.FLOAT);\n}\n\nexport
function getInternalFormatForFloat16PackedMatrixTexture(\n  textureConfig: TextureConfig) {\n return
textureConfig.internalFormatPackedHalfFloat;\n}\n\nexport function createFloat16PackedMatrixTexture(\n  gl:
WebGLRenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n  tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n  gl, width, height,\n
getInternalFormatForFloat16PackedMatrixTexture(textureConfig), gl.RGBA,\n
textureConfig.textureTypeHalfFloat);\n}\n\nexport function bindVertexProgramAttributeStreams(\n  gl:
WebGLRenderingContext, program: WebGLProgram,\n  vertexBuffer: WebGLBuffer): boolean {\n  const
posOffset = 0;          // x is the first buffer element\n  const uvOffset = 3 * 4;          // uv comes after [x y z]\n
const stride = (3 * 4) + (2 * 4); // xyz + uv, each entry is 4-byte float.\n  webgl_util.callAndCheck(\n  gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, vertexBuffer));\n  const success =
webgl_util.bindVertexBufferToProgramAttribute(\n  gl, program, 'clipSpacePos', vertexBuffer, 3, stride,
posOffset);\n  return success &&\n  webgl_util.bindVertexBufferToProgramAttribute(\n  gl, program, 'uv',
vertexBuffer, 2, stride, uvOffset);\n}\n\nexport function uploadDenseMatrixToTexture(\n  gl:
WebGLRenderingContext, texture: WebGLTexture, width: number,\n  height: number, data: TypedArray,
textureConfig: TextureConfig) {\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D,
texture));\n  let dataForUpload: TypedArray, texelDataType: number, internalFormat: number;\n  if (data
instanceof Uint8Array) {\n    dataForUpload = new Uint8Array(width * height * 4);\n    texelDataType =
gl.UNSIGNED_BYTE;\n    internalFormat = gl.RGBA;\n  } else {\n    dataForUpload = new Float32Array(width *
height * 4);\n    texelDataType = gl.FLOAT;\n    internalFormat = textureConfig.internalFormatPackedFloat;\n
}\n  dataForUpload.set(data);\n  webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, internalFormat, width, height, 0, gl.RGBA,\n  texelDataType, dataForUpload));\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n}\n\nexport function
uploadPixelDataToTexture(\n  gl: WebGLRenderingContext, texture: WebGLTexture,\n  pixels:
PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n  HTMLVideoElement) {\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, texture));\n  if ((pixels as PixelData).data
instanceof Uint8Array) {\n    webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, pixels.width, pixels.height, 0, gl.RGBA,\n  gl.UNSIGNED_BYTE, (pixels as
PixelData).data));\n  } else {\n    webgl_util.callAndCheck(\n  gl,\n  () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, gl.RGBA, gl.UNSIGNED_BYTE,\n  pixels as ImageData |
HTMLImageElement | HTMLCanvasElement |\n  HTMLVideoElement));\n  }\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n}\n\nexport function
createBufferFromOutputTexture(\n  gl2: WebGL2RenderingContext, rows: number, columns: number,\n  textureConfig: TextureConfig): WebGLBuffer {\n  // Create and bind the buffer.\n  const buffer =
gl2.createBuffer();\n  webgl_util.callAndCheck(\n  gl2, () => gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER,
buffer));\n  // Initialize the buffer to the size of the texture in bytes.\n  const bytesPerFloat = 4;\n  const
valuesPerTexel = 4;\n  const bufferSizeBytes = bytesPerFloat * valuesPerTexel * rows * columns;\n  webgl_util.callAndCheck(\n  gl2,\n  () => gl2.bufferData(\n  gl2.PIXEL_PACK_BUFFER,
bufferSizeBytes, gl2.STREAM_READ));\n  // Enqueue a command on the GPU command queue to copy of
texture into the\n  // buffer.\n  webgl_util.callAndCheck(\n  gl2, () => gl2.readPixels(0, 0, columns, rows,

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gl2.RGBA, gl2.FLOAT, 0));\n\n webgl_util.callAndCheck(\n    gl2, () =>
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null));\n\n return buffer;\n}\n\nexport function
downloadFloat32MatrixFromBuffer(\n    gl: WebGLRenderingContext, buffer: WebGLBuffer,\n    size: number):
Float32Array {\n    const gl2 = gl as WebGL2RenderingContext;\n\n    const downloadTarget = new
Float32Array(size);\n\n    gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n
gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0, downloadTarget);\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n    return downloadTarget;\n}\n\nexport function
downloadByteEncodedFloatMatrixFromOutputTexture(\n    gl: WebGLRenderingContext, rows: number, columns:
number,\n    textureConfig: TextureConfig) {\n    const [w, h] =\n    tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n\n    const numChannels = 4;\n    const
downloadTarget = new Uint8Array(\n        tex_util.getUnpackedArraySizeFromMatrixSize(rows * columns,
numChannels));\n\n    webgl_util.callAndCheck(\n        gl,\n        () => gl.readPixels(\n            0, 0, w, h,
textureConfig.downloadTextureFormat, gl.UNSIGNED_BYTE,\n            downloadTarget));\n\n    // By wrapping the
buffer in a Float32Array, we use native browser IEEE 754\n    // decoding of the 4 bytes that back each 32 bit float.\n
return new Float32Array(downloadTarget.buffer);\n}\n\nexport function downloadPackedMatrixFromBuffer(\n
gl: WebGLRenderingContext, buffer: WebGLBuffer, batch: number, rows: number,\n    cols: number,
physicalRows: number, physicalCols: number,\n    textureConfig: TextureConfig): Float32Array {\n    const gl2 = gl
as WebGL2RenderingContext;\n\n    const downloadTarget =\n    new
Float32Array(tex_util.getPackedRGBAArraySizeFromMatrixShape(\n        physicalRows, physicalCols));\n\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n    gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0,
downloadTarget);\n    gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n    return downloadTarget;\n}\n\nexport
function downloadMatrixFromPackedOutputTexture(\n    gl: WebGLRenderingContext, physicalRows: number,\n
physicalCols: number): Float32Array {\n    const packedRGBA = new Float32Array(physicalRows * physicalCols *
4);\n    webgl_util.callAndCheck(\n        gl,\n        () => gl.readPixels(\n            0, 0, physicalCols, physicalRows,
gl.RGBA, gl.FLOAT, packedRGBA));\n\n    return packedRGBA;\n}\n\n"/**\n * @license\n * Copyright 2017
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=====\n
*\n\nimport {env, PixelData, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext,
setWebGLContext} from './canvas_util';\n\nimport * as gpgpu_util from './gpgpu_util';\n\nimport * as tex_util from
 './tex_util';\n\nimport {TextureConfig} from './tex_util';\n\nimport {WebGL1DisjointQueryTimerExtension,
WebGL2DisjointQueryTimerExtension} from './webgl_types';\n\nimport * as webgl_util from
 './webgl_util';\n\nexport interface FenceContext {\n    query: WebGLQuery|WebGLSync;\n    isFencePassed():
boolean;\n}\n\nexport class GPGPUContext {\n    gl: WebGLRenderingContext;\n    textureFloatExtension: {};\n
textureHalfFloatExtension: {};\n    colorBufferFloatExtension: {};\n    colorBufferHalfFloatExtension: {};\n
disjointQueryTimerExtension: WebGL2DisjointQueryTimerExtension|\n
WebGL1DisjointQueryTimerExtension;\n    vertexBuffer: WebGLBuffer;\n    indexBuffer: WebGLBuffer;\n
framebuffer: WebGLFramebuffer;\n    outputTexture: WebGLTexture|null = null;\n    program: WebGLProgram|null =
null;\n    private disposed = false;\n    private disjoint: boolean;\n    textureConfig: TextureConfig;\n\n    constructor(gl?:
WebGLRenderingContext) {\n        const glVersion = env().getNumber('WEBGL_VERSION');\n        if (gl != null) {\n
            this.gl = gl;\n            setWebGLContext(glVersion, gl);\n        } else {\n            this.gl =
getWebGLContext(glVersion);\n        }\n        // WebGL 2.0 enables texture floats without an extension.\n
        let COLOR_BUFFER_FLOAT =
'WEBGL_color_buffer_float';\n        const COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n        if
(env().getNumber('WEBGL_VERSION') === 1) {\n            const TEXTURE_FLOAT = 'OES_texture_float';\n

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const TEXTURE_HALF_FLOAT = 'OES_texture_half_float';\n    this.textureFloatExtension =\nwebgl_util.getExtensionOrThrow(this.gl, TEXTURE_FLOAT);\n    if (webgl_util.hasExtension(this.gl,\nTEXTURE_HALF_FLOAT)) {\n        this.textureHalfFloatExtension =\nwebgl_util.getExtensionOrThrow(this.gl, TEXTURE_HALF_FLOAT);\n    } else if\n(env().get('WEBGL_FORCE_F16_TEXTURES')) {\n        throw new Error(\n            'GL context does not support\nhalf float textures, yet the '\n            'environment flag WEBGL_FORCE_F16_TEXTURES is set to true.);\n    }\n    this.colorBufferFloatExtension = this.gl.getExtension(COLOR_BUFFER_FLOAT);\n    if\n(webgl_util.hasExtension(this.gl, COLOR_BUFFER_HALF_FLOAT)) {\n        this.colorBufferHalfFloatExtension\n=\n        webgl_util.getExtensionOrThrow(this.gl, COLOR_BUFFER_HALF_FLOAT);\n    } else if\n(env().get('WEBGL_FORCE_F16_TEXTURES')) {\n        throw new Error(\n            'GL context does not support\ncolor renderable half floats, yet '\n            'the environment flag WEBGL_FORCE_F16_TEXTURES is set to\ntrue.);\n    }\n    } else {\n        COLOR_BUFFER_FLOAT = 'EXT_color_buffer_float';\n        if\n(webgl_util.hasExtension(this.gl, COLOR_BUFFER_FLOAT)) {\n            this.colorBufferFloatExtension =\nthis.gl.getExtension(COLOR_BUFFER_FLOAT);\n        } else if (webgl_util.hasExtension(this.gl,\nCOLOR_BUFFER_HALF_FLOAT)) {\n            this.colorBufferHalfFloatExtension =\nthis.gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\n        } else {\n            throw new Error('GL context does not\nsupport color renderable floats');\n        }\n    }\n    this.vertexBuffer = gpgpu_util.createVertexBuffer(this.gl);\n    this.indexBuffer = gpgpu_util.createIndexBuffer(this.gl);\n    this.framebuffer =\nwebgl_util.createFramebuffer(this.gl);\n    this.textureConfig =\n    tex_util.getTextureConfig(this.gl,\nthis.textureHalfFloatExtension);\n}\n\nprivate get debug(): boolean {\n    return env().getBool('DEBUG');\n}\n\npublic dispose() {\n    if (this.disposed) {\n        return;\n    }\n    if (this.program != null) {\n        console.warn(\n'Disposing a GPGPUContext that still has a bound WebGLProgram.' +\n        ' This is probably a resource leak,\ndelete the program with '\n        'GPGPUContext.deleteProgram before disposing.);\n    }\n    if\n(this.outputTexture != null) {\n        console.warn(\n            'Disposing a GPGPUContext that still has a bound output\nmatrix '\n            'texture. This is probably a resource leak, delete the output '\n            'matrix texture with\nGPGPUContext.deleteMatrixTexture before '\n            'disposing.);\n    }\n    const gl = this.gl;\n    webgl_util.callAndCheck(gl, () => gl.finish());\n    webgl_util.callAndCheck(gl, () =>\ngl.bindFramebuffer(gl.FRAMEBUFFER, null));\n    webgl_util.callAndCheck(gl, () =>\ngl.deleteFramebuffer(this.framebuffer));\n    webgl_util.callAndCheck(gl, () =>\ngl.bindBuffer(gl.ARRAY_BUFFER, null));\n    webgl_util.callAndCheck(\n        gl, () =>\ngl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, null));\n    webgl_util.callAndCheck(gl, () =>\ngl.deleteBuffer(this.indexBuffer));\n    this.disposed = true;\n}\n\npublic createFloat32MatrixTexture(rows:\nnumber, columns: number):\n    WebGLTexture {\n        this.throwIfDisposed();\n        return\n        gpgpu_util.createFloat32MatrixTexture(\n            this.gl, rows, columns, this.textureConfig);\n    }\n\npublic\ncreateFloat16MatrixTexture(rows: number, columns: number):\n    WebGLTexture {\n        this.throwIfDisposed();\n        return gpgpu_util.createFloat16MatrixTexture(\n            this.gl, rows, columns, this.textureConfig);\n    }\n\npublic\ncreateUnsignedBytesMatrixTexture(rows: number, columns: number):\n    WebGLTexture {\n        this.throwIfDisposed();\n        return gpgpu_util.createUnsignedBytesMatrixTexture(\n            this.gl, rows, columns,\n            this.textureConfig);\n    }\n\npublic uploadPixelDataToTexture(\n    texture: WebGLTexture,\n    pixels:\n    PixelData|ImageData|HTMLImageElement|HTMLCanvasElement) {\n        this.throwIfDisposed();\n        gpgpu_util.uploadPixelDataToTexture(this.gl, texture, pixels);\n    }\n\npublic uploadDenseMatrixToTexture(\n    texture: WebGLTexture, width: number, height: number, data: TypedArray) {\n        this.throwIfDisposed();\n        gpgpu_util.uploadDenseMatrixToTexture(\n            this.gl, texture, width, height, data, this.textureConfig);\n    }\n\npublic createFloat16PackedMatrixTexture(rows: number, columns: number):\n    WebGLTexture {\n        this.throwIfDisposed();\n        return gpgpu_util.createFloat16PackedMatrixTexture(\n            this.gl, rows, columns,\n            this.textureConfig);\n    }\n\npublic createPackedMatrixTexture(rows: number, columns: number):\n    WebGLTexture {\n        this.throwIfDisposed();\n        return gpgpu_util.createPackedMatrixTexture(\n            this.gl, rows,\n            columns, this.textureConfig);\n    }\n\npublic deleteMatrixTexture(texture: WebGLTexture) {\n

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this.throwIfDisposed();\n  if (this.outputTexture === texture) {\n
webgl_util.unbindColorTextureFromFramebuffer(this.gl, this.framebuffer);\n  this.outputTexture = null;\n  }\n
webgl_util.callAndCheck(this.gl, () => this.gl.deleteTexture(texture));\n  }\n\n public
downloadByteEncodedFloatMatrixFromOutputTexture(\n  texture: WebGLTexture, rows: number, columns:
number): Float32Array {\n  return this.downloadMatrixDriver(\n  texture,\n  () =>
gpgpu_util.downloadByteEncodedFloatMatrixFromOutputTexture(\n    this.gl, rows, columns,
this.textureConfig));\n  }\n\n public downloadPackedMatrixFromBuffer(\n  buffer: WebGLBuffer, batch:
number, rows: number, columns: number,\n  physicalRows: number, physicalCols: number): Float32Array {\n
return gpgpu_util.downloadPackedMatrixFromBuffer(\n  this.gl, buffer, batch, rows, columns, physicalRows,
physicalCols,\n  this.textureConfig);\n  }\n\n public downloadFloat32MatrixFromBuffer(buffer: WebGLBuffer,
size: number):\n  Float32Array {\n  return gpgpu_util.downloadFloat32MatrixFromBuffer(this.gl, buffer,
size);\n  }\n\n public createBufferFromTexture(\n  texture: WebGLTexture, rows: number, columns: number):
WebGLBuffer {\n  this.bindTextureToFramebuffer(texture);\n  const result =
gpgpu_util.createBufferFromOutputTexture(\n  this.gl as WebGL2RenderingContext, rows, columns,
this.textureConfig);\n  this.unbindTextureToFramebuffer();\n  return result;\n  }\n\n public
createAndWaitForFence(): Promise<void> {\n  const fenceContext = this.createFence(this.gl);\n  return
this.pollFence(fenceContext);\n  }\n\n private createFence(gl: WebGLRenderingContext): FenceContext {\n  let
query: WebGLQuery|WebGLSync;\n  let isFencePassed: () => boolean;\n\n  if
(env().getBool('WEBGL_FENCE_API_ENABLED')) {\n  const gl2 = gl as WebGL2RenderingContext;\n\n
const sync = gl2.fenceSync(gl2.SYNC_GPU_COMMANDS_COMPLETE, 0);\n  gl.flush();\n\n
isFencePassed = () => {\n  const status = gl2.clientWaitSync(sync, 0, 0);\n  return status ===
gl2.ALREADY_SIGNALED ||\n    status === gl2.CONDITION_SATISFIED;\n  };\n\n  query = sync;\n
} else if (\n  env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0) {\n
query = this.beginQuery();\n  this.endQuery();\n  isFencePassed = () => this.isQueryAvailable(\n  query,\n
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION'));\n  } else {\n  // If
we have no way to fence, return true immediately. This will fire in\n  // WebGL 1.0 when there is no disjoint
query timer. In this case, because\n  // the fence passes immediately, we'll immediately ask for a download of\n
// the texture, which will cause the UI thread to hang.\n  isFencePassed = () => true;\n  }\n\n  return {query,
isFencePassed};\n  }\n\n public downloadMatrixFromPackedTexture(\n  texture: WebGLTexture, physicalRows:
number,\n  physicalCols: number): Float32Array {\n  return this.downloadMatrixDriver(\n  texture,\n  ()
=> gpgpu_util.downloadMatrixFromPackedOutputTexture(\n    this.gl, physicalRows, physicalCols));\n  }\n\n
private vertexAttrsAreBound = false;\n\n public createProgram(fragmentShaderSource: string): WebGLProgram
{\n  this.throwIfDisposed();\n  const gl = this.gl;\n  const fragmentShader: WebGLShader =\n
webgl_util.createFragmentShader(gl, fragmentShaderSource);\n  const vertexShader: WebGLShader =
gpgpu_util.createVertexShader(gl);\n  const program: WebGLProgram = webgl_util.createProgram(gl);\n
webgl_util.callAndCheck(gl, () => gl.attachShader(program, vertexShader));\n  webgl_util.callAndCheck(gl, () =>
gl.attachShader(program, fragmentShader));\n  webgl_util.linkProgram(gl, program);\n  if (this.debug) {\n
webgl_util.validateProgram(gl, program);\n  }\n  if (!this.vertexAttrsAreBound) {\n
this.setProgram(program);\n  this.vertexAttrsAreBound = gpgpu_util.bindVertexProgramAttributeStreams(\n
gl, this.program, this.vertexBuffer);\n  }\n  return program;\n  }\n\n public deleteProgram(program:
WebGLProgram) {\n  this.throwIfDisposed();\n  if (program === this.program) {\n  this.program = null;\n
}\n  if (program != null) {\n  webgl_util.callAndCheck(this.gl, () => this.gl.deleteProgram(program));\n
}\n\n public setProgram(program: WebGLProgram|null) {\n  this.throwIfDisposed();\n  this.program =
program;\n  if ((this.program != null) && this.debug) {\n  webgl_util.validateProgram(this.gl, this.program);\n
}\n  webgl_util.callAndCheck(this.gl, () => this.gl.useProgram(program));\n  }\n\n public getUniformLocation(\n
program: WebGLProgram, uniformName: string,\n  shouldThrow = true): WebGLUniformLocation {\n
this.throwIfDisposed();\n  if (shouldThrow) {\n  return webgl_util.getProgramUniformLocationOrThrow(\n
this.gl, program, uniformName);\n  } else {\n  return webgl_util.getProgramUniformLocation(\n  this.gl,

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env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION');\n }\n\n private
getQueryTime(query: WebGLQuery, queryTimerVersion: number): number {\n  if (queryTimerVersion === 0) {\n
  return null;\n  }\n\n  if (queryTimerVersion === 2) {\n    const gl2 = this.gl as WebGL2RenderingContext;\n\n    const timeElapsedNanos = gl2.getQueryParameter(query, gl2.QUERY_RESULT);\n    // Return milliseconds.\n    return timeElapsedNanos / 1000000;\n  } else {\n    const ext = this.getQueryTimerExtensionWebGL1();\n\n    const timeElapsedNanos =\n      ext.getQueryObjectEXT(query, ext.QUERY_RESULT_EXT);\n    // Return
milliseconds.\n    return timeElapsedNanos / 1000000;\n  }\n }\n\n private isQueryAvailable(query:
WebGLQuery, queryTimerVersion: number):\n  boolean {\n  if (queryTimerVersion === 0) {\n    return true;\n
  }\n\n  if (queryTimerVersion === 2) {\n    const gl2 = this.gl as WebGL2RenderingContext;\n    const ext =
this.getQueryTimerExtensionWebGL2();\n\n    const available =\n      gl2.getQueryParameter(query,
gl2.QUERY_RESULT_AVAILABLE);\n    if (this.disjoint == null) {\n      this.disjoint =
this.gl.getParameter(ext.GPU_DISJOINT_EXT);\n    }\n\n    return available && !this.disjoint;\n  } else {\n
const ext = this.getQueryTimerExtensionWebGL1();\n\n    const available =\n      ext.getQueryObjectEXT(query, ext.QUERY_RESULT_AVAILABLE_EXT);\n    if (this.disjoint == null) {\n
this.disjoint = this.gl.getParameter(ext.GPU_DISJOINT_EXT);\n    }\n\n    return available && !this.disjoint;\n
  }\n }\n\n pollFence(fenceContext: FenceContext) {\n  return new Promise<void>(resolve => {\n
this.addItemToPoll(() => fenceContext.isFencePassed(), () => resolve());\n  });\n }\n\n private itemsToPoll:
PollItem[] = [];\n\n pollItems(): void {\n  // Find the last query that has finished.\n  const index =
linearSearchLastTrue(this.itemsToPoll.map(x => x.isDoneFn));\n  for (let i = 0; i <= index; ++i) {\n    const
{resolveFn} = this.itemsToPoll[i];\n    resolveFn();\n  }\n  this.itemsToPoll = this.itemsToPoll.slice(index +
1);\n }\n\n private addItemToPoll(isDoneFn: () => boolean, resolveFn: () => void) {\n
this.itemsToPoll.push({isDoneFn, resolveFn});\n  if (this.itemsToPoll.length > 1) {\n    // We already have a
running loop that polls.\n    return;\n  }\n  // Start a new loop that polls.\n  util.repeatedTry(() => {\n
this.pollItems();\n  // End the loop if no more items to poll.\n  return this.itemsToPoll.length === 0;\n });\n
}\n\n private bindTextureToFramebuffer(texture: WebGLTexture) {\n  this.throwIfDisposed();\n
webgl_util.bindColorTextureToFramebuffer(\n    this.gl, texture, this.framebuffer);\n  if (this.debug) {\n
webgl_util.validateFramebuffer(this.gl);\n  }\n }\n\n private unbindTextureToFramebuffer() {\n  if
(this.outputTexture != null) {\n    webgl_util.bindColorTextureToFramebuffer(\n      this.gl, this.outputTexture,
this.framebuffer);\n    if (this.debug) {\n      webgl_util.validateFramebuffer(this.gl);\n    }\n  } else {\n
webgl_util.unbindColorTextureFromFramebuffer(this.gl, this.framebuffer);\n  }\n }\n\n private
downloadMatrixDriver(\n  texture: WebGLTexture,\n  downloadAndDecode: () => Float32Array):
Float32Array {\n  this.bindTextureToFramebuffer(texture);\n  const result = downloadAndDecode();\n
this.unbindTextureToFramebuffer();\n  return result;\n }\n\n private setOutputMatrixTextureDriver(\n
outputMatrixTextureMaybePacked: WebGLTexture, width: number,\n  height: number) {\n
this.throwIfDisposed();\n  const gl = this.gl;\n  webgl_util.bindColorTextureToFramebuffer(\n    gl,
outputMatrixTextureMaybePacked, this.framebuffer);\n  if (this.debug) {\n
webgl_util.validateFramebuffer(gl);\n  }\n  this.outputTexture = outputMatrixTextureMaybePacked;\n
webgl_util.callAndCheck(gl, () => gl.viewport(0, 0, width, height));\n  webgl_util.callAndCheck(gl, () =>
gl.scissor(0, 0, width, height));\n }\n\n private setOutputMatrixWriteRegionDriver(\n  x: number, y: number,
width: number, height: number) {\n  this.throwIfDisposed();\n  webgl_util.callAndCheck(\n    this.gl, () =>
this.gl.scissor(x, y, width, height);\n  }\n }\n\n private throwIfDisposed() {\n  if (this.disposed) {\n
throw new Error('Attempted to use disposed GPGPUContext.);\n  }\n }\n\n private throwIfNoProgram() {\n  if
(this.program == null) {\n    throw new Error('No GPU program is currently set.);\n  }\n }\n\n\n\n\n\n\n\ntype PollItem =
{\n  isDoneFn: () => boolean,\n  resolveFn: () => void\n};\n\n/**\n * Finds the index of the last true element using
linear search.\n * Note: We can't do binary search because Chrome expects us to explicitly\n * test all fences before
download.\n * https://github.com/tensorflow/tfjs/issues/1145\n */\nexport function linearSearchLastTrue(arr:
Array<() => boolean>): number {\n  let i = 0;\n  for (; i < arr.length; ++i) {\n    const isDone = arr[i];\n    if
(!isDone) {\n      break;\n    }\n  }\n  return i - 1;\n }\n\n", "/*\n * @license\n * Copyright 2017 Google LLC. All

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=====\n*\n\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nconst { getBroadcastDims } = backend_util;\nimport { getGlsIDifferences, GLSL } from './gls_version';\nimport * as shader_util from './shader_compiler_util';\n\nexport type ShapeInfo = {\n  logicalShape: number[],\n  texShape: [number, number],\n  isUniform: boolean,\n  isPacked: boolean,\n  flatOffset: number\n};\n\nexport type InputInfo = {\n  name: string,\n  shapeInfo: ShapeInfo\n};\n\nexport function makeShader(\n  inputsInfo: InputInfo[],\n  outputShape: ShapeInfo,\n  userCode: string,\n  usesPackedTextures: boolean): string {\n  const prefixSnippets: string[] = [];\n  inputsInfo.forEach(x => {\n    const size = util.sizeFromShape(x.shapeInfo.logicalShape);\n    // Snippet when we decided to upload the values as uniform.\n    if (x.shapeInfo.isUniform) {\n      prefixSnippets.push(`uniform float ${x.name}${size > 1 ? `[${size}]` : ""};`);\n    } else {\n      prefixSnippets.push(`uniform sampler2D ${x.name};`);\n      prefixSnippets.push(`uniform int offset${x.name};`);\n    }\n    const inputPrefixSnippet = prefixSnippets.join("\\n");\n    const inputSamplingSnippet =\n      inputsInfo\n        .map(x => getInputSamplingSnippet(x, outputShape, usesPackedTextures))\n        .join("\\n");\n    const outTexShape = outputShape.texShape;\n    const glsl = getGlsIDifferences();\n    const floatTextureSampleSnippet =\n      getFloatTextureSampleSnippet(glsl);\n    let outputSamplingSnippet: string;\n    let floatTextureSetOutputSnippet: string;\n    let shaderPrefix = getShaderPrefix(glsl);\n    if (outputShape.isPacked) {\n      outputSamplingSnippet =\n        getPackedOutputSamplingSnippet(outputShape.logicalShape, outTexShape);\n      floatTextureSetOutputSnippet =\n        getFloatTextureSetRGBASnippet(glsl);\n    } else {\n      outputSamplingSnippet =\n        getOutputSamplingSnippet(outputShape.logicalShape, outTexShape);\n      floatTextureSetOutputSnippet =\n        getFloatTextureSetRSnippet(glsl);\n    }\n    if (usesPackedTextures) {\n      shaderPrefix +=\n        SHADER_PACKED_PREFIX;\n    }\n    const source = [\n      shaderPrefix, floatTextureSampleSnippet,\n      floatTextureSetOutputSnippet,\n      inputPrefixSnippet, outputSamplingSnippet, inputSamplingSnippet, userCode\n    ].join("\\n");\n    return source;\n  });\n\nfunction getSamplerFromInInfo(inInfo: InputInfo): string {\n  const shape = inInfo.shapeInfo.logicalShape;\n  switch (shape.length) {\n    case 0:\n      return getSamplerScalar(inInfo);\n    case 1:\n      return getSampler1D(inInfo);\n    case 2:\n      return getSampler2D(inInfo);\n    case 3:\n      return getSampler3D(inInfo);\n    case 4:\n      return getSampler4D(inInfo);\n    case 5:\n      return getSampler5D(inInfo);\n    case 6:\n      return getSampler6D(inInfo);\n    default:\n      throw new Error(`\n        ${shape.length}-D input sampling` +\n        ` is not yet supported`);\n  }\n}\n\nfunction getPackedSamplerFromInInfo(inInfo: InputInfo): string {\n  const shape = inInfo.shapeInfo.logicalShape;\n  switch (shape.length) {\n    case 0:\n      return getPackedSamplerScalar(inInfo);\n    case 1:\n      return getPackedSampler1D(inInfo);\n    case 2:\n      return getPackedSampler2D(inInfo);\n    case 3:\n      return getPackedSampler3D(inInfo);\n    default:\n      return getPackedSamplerND(inInfo);\n  }\n}\n\nfunction getInputSamplingSnippet(\n  inInfo: InputInfo,\n  outShapeInfo: ShapeInfo,\n  usesPackedTextures = false): string {\n  let res = "";\n  if (usesPackedTextures) {\n    res += getPackedSamplerFromInInfo(inInfo);\n  } else {\n    res += getSamplerFromInInfo(inInfo);\n  }\n  const inShape = inInfo.shapeInfo.logicalShape;\n  const outShape = outShapeInfo.logicalShape;\n  if (inShape.length <= outShape.length) {\n    if (usesPackedTextures) {\n      res +=\n        getPackedSamplerAtOutputCoords(inInfo, outShapeInfo);\n    } else {\n      res +=\n        getSamplerAtOutputCoords(inInfo, outShapeInfo);\n    }\n  }\n  return res;\n}\n\nfunction getPackedOutputSamplingSnippet(\n  outShape: number[],\n  outTexShape: [number, number]): string {\n  switch (outShape.length) {\n    case 0:\n      return getOutputScalarCoords();\n    case 1:\n      return getOutputPacked1DCoords(outShape as [number], outTexShape);\n    case 2:\n      return getOutputPacked2DCoords(outShape as [number, number], outTexShape);\n    case 3:\n      return
```



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getOutputPacked3DCoords(\n      outShape as [number, number, number], outTexShape);\n default:\n return
getOutputPackedNDCoords(outShape, outTexShape);\n }\n}\n\nfunction getOutputSamplingSnippet(\n
outShape: number[], outTexShape: [number, number]): string {\n switch (outShape.length) {\n case 0:\n return
getOutputScalarCoords();\n case 1:\n return getOutput1DCoords(outShape as [number], outTexShape);\n
case 2:\n return getOutput2DCoords(outShape as [number, number], outTexShape);\n case 3:\n return
getOutput3DCoords(\n      outShape as [number, number, number], outTexShape);\n case 4:\n return
getOutput4DCoords(\n      outShape as [number, number, number, number], outTexShape);\n case 5:\n return
getOutput5DCoords(\n      outShape as [number, number, number, number, number], outTexShape);\n case 6:\n
return getOutput6DCoords(\n      outShape as [number, number, number, number, number, number],\n
outTexShape);\n default:\n throw new Error(\n      `${outShape.length}-D output sampling is not yet
supported`);\n }\n}\n}\n\nfunction getFloatTextureSampleSnippet(glsl: GLSL): string {\n return `\n float
sampleTexture(sampler2D textureSampler, vec2 uv) {\n return ${glsl.texture2D}(textureSampler, uv).r;\n }\n
`;\n}\n\nfunction getFloatTextureSetRSnippet(glsl: GLSL): string {\n return `\n void setOutput(float val) {\n
${glsl.output} = vec4(val, 0, 0, 0);\n }\n `;\n}\n\nfunction getFloatTextureSetRGBASnippet(glsl: GLSL): string
{\n return `\n void setOutput(vec4 val) {\n ${glsl.output} = val;\n }\n `;\n}\n\nfunction getShaderPrefix(glsl:
GLSL): string {\n const SHADER_PREFIX = `${glsl.version}\n precision highp float;\n precision highp int;\n
precision highp sampler2D;\n ${glsl.varyingFs} vec2 resultUV;\n ${glsl.defineOutput}\n const vec2 halfCR =
vec2(0.5, 0.5);\n\n struct ivec5\n {\n int x;\n int y;\n int z;\n int w;\n int u;\n };\n\n struct
ivec6\n {\n int x;\n int y;\n int z;\n int w;\n int u;\n int v;\n };\n\n uniform float NAN;\n
${glsl.defineSpecialNaN}\n ${glsl.defineSpecialInf}\n ${glsl.defineRound}\n\n int imod(int x, int y) {\n
return x - y * (x / y);\n }\n\n int idiv(int a, int b, float sign) {\n int res = a / b;\n int mod = imod(a, b);\n
if (sign < 0. && mod != 0) {\n res -= 1;\n }\n return res;\n }\n\n //Based on the work of Dave
Hoskins\n //https://www.shadertoy.com/view/4djSRW\n #define HASHSCALE1 443.8975\n float
random(float seed){\n vec2 p = resultUV * seed;\n vec3 p3 = fract(vec3(p.xy) * HASHSCALE1);\n p3
+= dot(p3, p3.yzx + 19.19);\n return fract((p3.x + p3.y) * p3.z);\n }\n\n ${SAMPLE_1D_SNIPPET}\n
${SAMPLE_2D_SNIPPET}\n ${SAMPLE_3D_SNIPPET}\n `;\n\n return SHADER_PREFIX;\n}\n\nconst
SAMPLE_1D_SNIPPET = `\nvec2 uvFromFlat(int texNumR, int texNumC, int index) {\n int texR = index /
texNumC;\n int texC = index - texR * texNumC;\n return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\n\nvec2 packedUVfrom1D(int texNumR, int texNumC, int index) {\n int texelIndex = index / 2;\n int
texR = texelIndex / texNumC;\n int texC = texelIndex - texR * texNumC;\n return (vec2(texC, texR) + halfCR) /
vec2(texNumC, texNumR);\n}\n\n`;\n\nconst SAMPLE_2D_SNIPPET = `\nvec2 packedUVfrom2D(int
texelsInLogicalRow, int texNumR, int texNumC, int row, int col) {\n int texelIndex = (row / 2) *
texelsInLogicalRow + (col / 2);\n int texR = texelIndex / texNumC;\n int texC = texelIndex - texR * texNumC;\n
return (vec2(texC, texR) + halfCR) / vec2(texNumC, texNumR);\n}\n\n`;\n\nconst SAMPLE_3D_SNIPPET = `\nvec2
packedUVfrom3D(int texNumR, int texNumC, int texelsInBatch, int texelsInLogicalRow, int b, int row, int
col) {\n int index = b * texelsInBatch + (row / 2) * texelsInLogicalRow + (col / 2);\n int texR = index /
texNumC;\n int texC = index - texR * texNumC;\n return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\n\n`;\n\nconst SHADER_PACKED_PREFIX = `\n float getChannel(vec4 frag, vec2 innerDims) {\n
vec2 modCoord = mod(innerDims, 2.);\n return modCoord.x == 0. ? frag.r : frag.g;\n }\n\n (modCoord.y == 0. ?
frag.r : frag.g);\n }\n float getChannel(vec4 frag, int dim) {\n float modCoord =
mod(float(dim), 2.);\n return modCoord == 0. ? frag.r : frag.g;\n }\n\n`;\n\nfunction getOutputScalarCoords() {\n
return `\n int getOutputCoords() {\n return 0;\n }\n `;\n}\n\nfunction getOutputPacked1DCoords(\n shape:
[number], texShape: [number, number]): string {\n const packedTexShape =\n [Math.ceil(texShape[0] / 2),
Math.ceil(texShape[1] / 2)];\n if (packedTexShape[0] === 1) {\n return `\n int getOutputCoords() {\n
return 2 * int(resultUV.x * ${packedTexShape[1]}.0);\n }\n `;\n }\n\n if (packedTexShape[1] === 1) {\n
return `\n int getOutputCoords() {\n return 2 * int(resultUV.y * ${packedTexShape[0]}.0);\n }\n `;\n }\n\n
return `\n int getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx * \n
vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n return 2 * (resTexRC.x * ${packedTexShape[1]} +

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resTexRC.y);\n  }\n `;\n}\n\nfunction getOutput1DCoords(\n  shape: [number], texShape: [number, number]):
string {\n  if (texShape[0] === 1) {\n    return `    int getOutputCoords() {\n      return int(resultUV.x *
${texShape[1]}.0);\n    }\n `;\n  }\n  if (texShape[1] === 1) {\n    return `    int getOutputCoords() {\n
return int(resultUV.y * ${texShape[0]}.0);\n    }\n `;\n  }\n  return `    int getOutputCoords() {\n    ivec2
resTexRC = ivec2(resultUV.yx *\n                                vec2(${texShape[0]}, ${texShape[1]}));\n    return
resTexRC.x * ${texShape[1]} + resTexRC.y;\n  }\n `;\n}\n\nfunction getOutputPacked3DCoords(\n  shape:
[number, number, number], texShape: [number, number]): string {\n  const packedTexShape =\n[Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  const texelsInLogicalRow = Math.ceil(shape[2] / 2);\n
const texelsInBatch = texelsInLogicalRow * Math.ceil(shape[1] / 2);\n  return `    ivec3 getOutputCoords() {\n
ivec2 resTexRC = ivec2(resultUV.yx *\n                                vec2(${packedTexShape[0]},
${packedTexShape[1]}));\n    int index = resTexRC.x * ${packedTexShape[1]} + resTexRC.y;\n    int b =
index / ${texelsInBatch};\n    index -= b * ${texelsInBatch};\n\n    int r = 2 * (index / ${texelsInLogicalRow});\n
    int c = imod(index, ${texelsInLogicalRow}) * 2;\n    return ivec3(b, r, c);\n  }\n `;\n}\n\nfunction
getOutput3DCoords(\n  shape: [number, number, number], texShape: [number, number]): string {\n  const
coordsFromIndexSnippet =\n  shader_util.getLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n  return `
    ivec3 getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n                                vec2(${texShape[0]},
${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n
${coordsFromIndexSnippet}\n    return ivec3(r, c, d);\n  }\n `;\n}\n\nfunction getOutputPackedNDCoords(\n
shape: number[], texShape: [number, number]): string {\n  const packedTexShape =\n[Math.ceil(texShape[0] /
2), Math.ceil(texShape[1] / 2)];\n  const texelsInLogicalRow = Math.ceil(shape[shape.length - 1] / 2);\n  const
texelsInBatch =\n    texelsInLogicalRow * Math.ceil(shape[shape.length - 2] / 2);\n  let texelsInBatchN =
texelsInBatch;\n  let batches = ``;\n  let coords = `b, r, c`;\n  for (let b = 2; b < shape.length - 1; b++) {\n
texelsInBatchN *= shape[shape.length - b - 1];\n    batches = `\n    int b${b} = index / ${texelsInBatchN};\n
index -= b${b} * ${texelsInBatchN};\n    ` + batches;\n    coords = `b${b}, ` + coords;\n  }\n  return `
    ivec${shape.length} getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n                                vec2(${packedTexShape[0]},
${packedTexShape[1]}));\n    int index = resTexRC.x * ${packedTexShape[1]} +
resTexRC.y;\n\n    ${batches}\n    int b = index / ${texelsInBatch};\n    index -= b * ${texelsInBatch};\n\n
int r = 2 * (index / ${texelsInLogicalRow});\n    int c = imod(index, ${texelsInLogicalRow}) * 2;\n\n    return
ivec${shape.length}(${coords});\n  }\n `;\n}\n\nfunction getOutput4DCoords(\n  shape: [number, number,
number, number],\n  texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n    ['r', 'c', 'd', 'd2'], shape);\n  return `    ivec4
getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n                                vec2(${texShape[0]},
${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n    ${coordsFromIndexSnippet}\n
return ivec4(r, c,
d, d2);\n  }\n `;\n}\n\nfunction getOutput5DCoords(\n  shape: [number, number, number, number, number],\n
texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n    ['r', 'c', 'd', 'd2', 'd3'], shape);\n  return `    ivec5
getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx * vec2(${texShape[0]},\n
${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n\n
${coordsFromIndexSnippet}\n\n    ivec5 outShape = ivec5(r, c, d, d2, d3);\n    return outShape;\n  }\n
`;\n}\n\nfunction getOutput6DCoords(\n  shape: [number, number, number, number, number, number],\n
texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n    ['r', 'c', 'd', 'd2', 'd3', 'd4'], shape);\n  return `    ivec6
getOutputCoords() {\n    ivec2 resTexRC = ivec2(resultUV.yx *\n                                vec2(${texShape[0]},
${texShape[1]}));\n    int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n\n    ${coordsFromIndexSnippet}\n\n
ivec6 result =
ivec6(r, c, d, d2, d3, d4);\n    return result;\n  }\n `;\n}\n\nfunction getOutputPacked2DCoords(\n  shape:
[number, number], texShape: [number, number]): string {\n  const packedTexShape =\n[Math.ceil(texShape[0] /
2), Math.ceil(texShape[1] / 2)];\n  if (util.arraysEqual(shape, texShape)) {\n    return `    ivec2 getOutputCoords()
{\n    return 2 * ivec2(resultUV.yx * vec2(${packedTexShape[0]}, ${\n    packedTexShape[1]}));\n  }\n
`;\n  }

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`;
}

// texels needed to accommodate a logical row
const texelsInLogicalRow = Math.ceil(shape[1] / 2);

/**
 * getOutputCoords
 *
 * resTexRC: The rows and columns of the texels. If you move over one
 * texel to the right in the packed texture, you are moving over one column
 * (not two).
 *
 * index: The texel index
 */
return ivec2 getOutputCoords() {
  ivec2 resTexRC = ivec2(resultUV.yx *
    vec2($packedTexShape[0], $packedTexShape[1]));
  int index = resTexRC.x * $packedTexShape[1] +
    resTexRC.y;
  int r = 2 * (index / $texelsInLogicalRow);
  int c = imod(index, $texelsInLogicalRow) *
    2;
  return ivec2(r, c);
}

function getOutput2DCoords(
  shape: [number, number], texShape:
  [number, number]): string {
  if (util.arraysEqual(shape, texShape)) {
    return ivec2 getOutputCoords() {
      return ivec2(resultUV.yx *
        vec2($texShape[0], $texShape[1]));
    }
  }
  if (shape[1] === 1) {
    return ivec2 getOutputCoords() {
      ivec2 resTexRC = ivec2(resultUV.yx *
        vec2($texShape[0], $texShape[1]));
      int index = resTexRC.x * $texShape[1] +
        resTexRC.y;
      return ivec2(index, 0);
    }
  }
  if (shape[0] === 1) {
    return ivec2 getOutputCoords() {
      ivec2 resTexRC = ivec2(resultUV.yx *
        vec2($texShape[0], $texShape[1]));
      int index
        = resTexRC.x * $texShape[1] + resTexRC.y;
      return ivec2(0, index);
    }
  }
  return ivec2
    getOutputCoords() {
      ivec2 resTexRC = ivec2(resultUV.yx *
        vec2($texShape[0],
        $texShape[1]));
      int index = resTexRC.x * $texShape[1] +
        resTexRC.y;
      int r = index / $shape[1];
      int c = index - r * $shape[1];
      return ivec2(r, c);
    }
}

function
getFlatOffsetUniformName(texName: string): string {
  return `offset${texName}`;
}

function
getPackedSamplerScalar(inputInfo: InputInfo): string {
  const texName = inputInfo.name;
  const funcName =
    'get' + texName.charAt(0).toUpperCase() +
    texName.slice(1);
  const glsl = getGlslDifferences();
  return ivec4
    ${funcName}() {
      return ${glsl.texture2D}($texName, halfCR);
    }
}

function
getSamplerScalar(inputInfo: InputInfo): string {
  const texName = inputInfo.name;
  const funcName = 'get' +
    texName.charAt(0).toUpperCase() +
    texName.slice(1);
  if (inputInfo.shapeInfo.isUniform) {
    return float
      ${funcName}() {
        return ${texName};
      }
  }
  const [texNumR, texNumC] = inputInfo.shapeInfo.texShape;
  if (texNumR === 1 && texNumC === 1) {
    return float
      ${funcName}() {
        return
          sampleTexture($texName, halfCR);
      }
  }
  const [tNumR, tNumC] =
    inputInfo.shapeInfo.texShape;
  const offset = getFlatOffsetUniformName(texName);
  return float
    ${funcName}() {
      vec2 uv = uvFromFlat($tNumR, $tNumC,
        ${offset});
      return
        sampleTexture($texName, uv);
    }
}

function
getPackedSampler1D(inputInfo: InputInfo): string {
  const texName = inputInfo.name;
  const funcName = 'get' +
    texName.charAt(0).toUpperCase() +
    texName.slice(1);
  const texShape = inputInfo.shapeInfo.texShape;
  const packedTexShape =
    [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];
  const glsl = getGlslDifferences();
  return ivec4
    ${funcName}(int index) {
      vec2 uv = packedUVfrom1D(
        $packedTexShape[0],
        $packedTexShape[1], index);
      return ${glsl.texture2D}($texName, uv);
    }
}

function
getSampler1D(inputInfo: InputInfo): string {
  const texName = inputInfo.name;
  const funcName = 'get' +
    texName.charAt(0).toUpperCase() +
    texName.slice(1);
  if (inputInfo.shapeInfo.isUniform) {
    // Uniform arrays will be less than 65505 (no risk of float16 overflow).
    return float
      ${funcName}(int index) {
        return
          ${getUniformSampler(inputInfo)};
      }
  }
  const texShape = inputInfo.shapeInfo.texShape;
  const tNumR = texShape[0];
  const tNumC = texShape[1];
  if (tNumC === 1 && tNumR === 1) {
    return float
      ${funcName}(int index) {
        return
          sampleTexture($texName, halfCR);
      }
  }
  const offset
    = getFlatOffsetUniformName(texName);
  if (tNumC === 1) {
    return float
      ${funcName}(int index) {
        vec2 uv = vec2(0.5, (float(index +
          ${offset}) + 0.5) / $tNumR);
        return
          sampleTexture($texName,
          uv);
      }
  }
  if (tNumR === 1) {
    return float
      ${funcName}(int index) {
        vec2 uv =
          vec2((float(index + ${offset}) + 0.5) /
            $tNumC, 0.5);
        return
          sampleTexture($texName, uv);
      }
  }
  return float
    ${funcName}(int index) {
      vec2 uv = uvFromFlat($tNumR, $tNumC,
        index +
        ${offset});
      return
        sampleTexture($texName, uv);
    }
}

function
getPackedSampler2D(inputInfo:
InputInfo): string {
  const shape = inputInfo.shapeInfo.logicalShape;
  const texName = inputInfo.name;
  const funcName = 'get' +
    texName.charAt(0).toUpperCase() +
    texName.slice(1);
  const texShape =

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inputInfo.shapeInfo.texShape;\n\n const texNumR = texShape[0];\n const texNumC = texShape[1];\n const glsl =
getGlslDifferences();\n if (texShape != null && util.arraysEqual(shape, texShape)) {\n return \n vec4
${funcName}(int row, int col) {\n vec2 uv = (vec2(col, row) + halfCR) / vec2(${texNumC}.0,
${texNumR}.0);\n\n return ${glsl.texture2D}(${texName}, uv);\n }\n `;\n }\n\n const packedTexShape
=\n [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n const valuesPerRow = Math.ceil(shape[1] /
2);\n\n return \n vec4 ${funcName}(int row, int col) {\n vec2 uv = packedUVfrom2D(${valuesPerRow},
${packedTexShape[0]}, ${packedTexShape[1]}, row, col);\n return ${glsl.texture2D}(${texName}, uv);\n
}\n `;\n }\n\nfunction getSampler2D(inputInfo: InputInfo): string {\n const shape =
inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n\n if
(texShape != null && util.arraysEqual(shape, texShape)) {\n const texNumR = texShape[0];\n const texNumC =
texShape[1];\n return \n float ${funcName}(int row, int col) {\n vec2 uv = (vec2(col, row) + halfCR) /
vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n const
{newShape, keptDims} = util.squeezeShape(shape);\n const squeezedShape = newShape;\n if
(squeezedShape.length < shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n
const params = ['row', 'col'];\n return \n ${getSamplerFromInInfo(newInputInfo)}\n float ${funcName}(int
row, int col) {\n return ${funcName}(${getSqueezedParams(params, keptDims)});\n }\n `;\n }\n\n if
(inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return \n float ${funcName}(int row, int col) {\n int index = round(dot(vec2(row, col), vec2(${shape[1]},
1)));;\n ${getUniformSampler(inputInfo)}\n }\n `;\n }\n\n const texNumR = texShape[0];\n const
texNumC = texShape[1];\n const offset = getFlatOffsetUniformName(texName);\n if (texNumC === 1) {\n //
index is used directly as physical (no risk of float16 overflow).\n return \n float ${funcName}(int row, int col)
{\n float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n vec2 uv = vec2(0.5, (index + 0.5) /
${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n if (texNumR === 1) {\n // index
is used directly as physical (no risk of float16 overflow).\n return \n float ${funcName}(int row, int col) {\n
float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n vec2 uv = vec2((index + 0.5) /
${texNumC}.0, 0.5);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n return \n float
${funcName}(int row, int col) {\n // Explicitly use integer operations as dot() only works on floats.\n int index =
row * ${shape[1]} + col + ${offset};\n vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index);\n return
sampleTexture(${texName}, uv);\n }\n `;\n }\n\nfunction getPackedSampler3D(inputInfo: InputInfo): string {\n
const shape = inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n const
packedTexShape =\n [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n\n if (shape[0] === 1) {\n
const squeezedShape = shape.slice(1);\n const keptDims = [1, 2];\n const newInputInfo =
squeezeInputInfo(inputInfo, squeezedShape);\n const params = ['b', 'row', 'col'];\n return \n
${getPackedSamplerFromInInfo(newInputInfo)}\n vec4 ${funcName}(int b, int row, int col) {\n return
${funcName}(${getSqueezedParams(params, keptDims)});\n }\n `;\n }\n\n const texNumR =
packedTexShape[0];\n const texNumC = packedTexShape[1];\n const valuesPerRow = Math.ceil(shape[2] / 2);\n
const texelsInBatch = valuesPerRow * Math.ceil(shape[1] / 2);\n const glsl = getGlslDifferences();\n\n return \n
vec4 ${funcName}(int b, int row, int col) {\n vec2 uv = packedUVfrom3D(\n ${texNumR}, ${texNumC},
${texelsInBatch}, ${valuesPerRow}, b, row, col);\n return ${glsl.texture2D}(${texName}, uv);\n }\n
`\n }\n\nfunction getSampler3D(inputInfo: InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n
const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() +
texName.slice(1);\n const stride0 = shape[1] * shape[2];\n const stride1 = shape[2];\n\n const {newShape,
keptDims} = util.squeezeShape(shape);\n const squeezedShape = newShape;\n if (squeezedShape.length <
shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n const params = ['row',
'col', 'depth'];\n return \n ${getSamplerFromInInfo(newInputInfo)}\n float ${funcName}(int row, int col,
int depth) {\n return ${funcName}(${getSqueezedParams(params, keptDims)});\n }\n `;\n }\n\n if

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(inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return {\n float ${funcName}(int row, int col, int depth) {\n int index = round(dot(vec3(row, col, depth),\n
vec3(${stride0}, ${stride1}, 1));\n ${getUniformSampler(inputInfo)}\n }\n `;\n }\n\n const
texShape = inputInfo.shapeInfo.texShape;\n const texNumR = texShape[0];\n const texNumC = texShape[1];\n
const flatOffset = inputInfo.shapeInfo.flatOffset;\n if (texNumC === stride0 && flatOffset == null) {\n // texC is
used directly as physical (no risk of float16 overflow).\n return {\n float ${funcName}(int row, int col, int
depth) {\n float texR = float(row);\n float texC = dot(vec2(col, depth), vec2(${stride1}, 1));\n vec2
uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}.0, ${texNumR}.0);\n return
sampleTexture(${texName}, uv);\n }\n `;\n }\n\n if (texNumC === stride1 && flatOffset == null) {\n //
texR is used directly as physical (no risk of float16 overflow).\n return {\n float ${funcName}(int row, int col,
int depth) {\n float texR = dot(vec2(row, col), vec2(${shape[1]}, 1));\n float texC = float(depth);\n vec2
uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName},
uv);\n }\n `;\n }\n\n const offset = getFlatOffsetUniformName(texName);\n return {\n float ${funcName}(int
row, int col, int depth) {\n // Explicitly use integer operations as dot() only works on floats.\n int index =
row * ${stride0} + col * ${stride1} + depth + ${offset};\n vec2 uv = uvFromFlat(${texNumR}, ${texNumC},
index);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\nfunction getPackedSamplerND(inputInfo:
InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n const rank = shape.length;\n const
texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n
const texShape = inputInfo.shapeInfo.texShape;\n const packedTexShape =\n [Math.ceil(texShape[0] / 2),
Math.ceil(texShape[1] / 2)];\n const texNumR = packedTexShape[0];\n const texNumC = packedTexShape[1];\n\n
const valuesPerRow = Math.ceil(shape[rank - 1] / 2);\n let texelsInBatch = valuesPerRow * Math.ceil(shape[rank -
2] / 2);\n let params = `int b, int row, int col`;\n let index = `b * ${texelsInBatch} + (row / 2) * ${valuesPerRow} +
(col / 2)`;\n for (let b = 2; b < rank - 1; b++) {\n params = `int b${b}, ` + params;\n texelsInBatch *= shape[rank
- b - 1];\n index = `b${b} * ${texelsInBatch} + ` + index;\n }\n\n const glsl = getGlslDifferences();\n return {\n
vec4 ${funcName}(${params}) {\n int index = ${index};\n int texR = index / ${texNumC};\n int texC =
index - texR * ${texNumC};\n vec2 uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}, ${texNumR});\n
return ${glsl.texture2D}(${texName}, uv);\n }\n `;\n }\n\nfunction getSampler4D(inputInfo: InputInfo): string {\n
const shape = inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n const stride2 = shape[3];\n const stride1 = shape[2] *
stride2;\n const stride0 = shape[1] * stride1;\n const {newShape, keptDims} = util.squeezeShape(shape);\n if
(newShape.length < shape.length) {\n const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n const
params = ['row', 'col', 'depth', 'depth2'];\n return {\n ${getSamplerFromInInfo(newInputInfo)}\n float
${funcName}(int row, int col, int depth, int depth2) {\n return ${funcName}(${getSqueezedParams(params,
keptDims)});\n }\n `;\n }\n\n if (inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than
65505 (no risk of float16 overflow).\n return {\n float ${funcName}(int row, int col, int depth, int depth2) {\n
int index = round(dot(vec4(row, col, depth, depth2),\n vec4(${stride0}, ${stride1}, ${stride2},
1));\n ${getUniformSampler(inputInfo)}\n }\n `;\n }\n\n const flatOffset =
inputInfo.shapeInfo.flatOffset;\n const texShape = inputInfo.shapeInfo.texShape;\n const texNumR =
texShape[0];\n const texNumC = texShape[1];\n\n if (texNumC === stride0 && flatOffset == null) {\n // texC is
used directly as physical (no risk of float16 overflow).\n return {\n float ${funcName}(int row, int col, int
depth, int depth2) {\n float texR = float(row);\n float texC =\n dot(vec3(col, depth, depth2),\n
vec3(${stride1}, ${stride2}, 1));\n vec2 uv = (vec2(texC, texR) + halfCR) /\n vec2(${texNumC}.0,
${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n if (texNumC === stride2 &&
flatOffset == null) {\n // texR is used directly as physical (no risk of float16 overflow).\n return {\n float
${funcName}(int row, int col, int depth, int depth2) {\n float texR = dot(vec3(row, col, depth),\n
vec3(${shape[1] * shape[2]}, ${shape[2]}, 1));\n float texC = float(depth2);\n vec2 uv = (vec2(texC, texR)
+ halfCR) /\n vec2(${texNumC}.0, ${texNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n\n
const offset = getFlatOffsetUniformName(texName);\n return {\n float ${funcName}(int row, int

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col, int depth, int depth2) {\n    // Explicitly use integer operations as dot() only works on floats.\n    int index =
row * ${stride0} + col * ${stride1} +\n    depth * ${stride2} + depth2;\n    vec2 uv =
uvFromFlat(${texNumR}, ${texNumC}, index + ${offset});\n    return sampleTexture(${texName}, uv);\n    }\n
`;\n}\n\nfunction getSampler5D(inputInfo: InputInfo): string {\n    const shape = inputInfo.shapeInfo.logicalShape;\n    const texName = inputInfo.name;\n    const funcName = 'get' + texName.charAt(0).toUpperCase() +
texName.slice(1);\n    const stride3 = shape[4];\n    const stride2 = shape[3] * stride3;\n    const stride1 = shape[2] *
stride2;\n    const stride0 = shape[1] * stride1;\n\n    const {newShape, keptDims} = util.squeezeShape(shape);\n    if
(newShape.length < shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n    const
params = ['row', 'col', 'depth', 'depth2', 'depth3'];\n    return `\n    ${getSamplerFromInInfo(newInputInfo)}\n
float ${funcName}(int row, int col, int depth, int depth2, int depth3) {\n    return
${funcName}(${getSqueezedParams(params, keptDims)});\n    }\n    `;\n    }\n\n    if (inputInfo.shapeInfo.isUniform)
{\n    // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n    return `\n    float ${funcName}(int
row, int col, int depth, int depth2, int depth3) {\n    float index = dot(\n        vec4(row, col, depth, depth2),\n
vec4(${stride0}, ${stride1}, ${stride2}, ${stride3})) +\n        depth3;\n        ${getUniformSampler(inputInfo)}\n
    }\n    `;\n    }\n\n    const flatOffset = inputInfo.shapeInfo.flatOffset;\n    const texShape =
inputInfo.shapeInfo.texShape;\n    const texNumR = texShape[0];\n    const texNumC = texShape[1];\n\n    if (texNumC
=== stride0 && flatOffset === null) {\n    // texC is used directly as physical (no risk of float16 overflow).\n    return
`\n    float ${funcName}(int row, int col, int depth, int depth2, int depth3) {\n    int texR = row;\n    float texC
= dot(vec4(col, depth, depth2, depth3),\n        vec4(${stride1}, ${stride2}, ${stride3}, 1));\n    vec2 uv
= (vec2(texC, texR) + halfCR) /\n        vec2(${texNumC}.0, ${texNumR}.0);\n    return
sampleTexture(${texName}, uv);\n    }\n    `;\n    }\n\n    if (texNumC === stride3 && flatOffset === null) {\n    //
texR is used directly as physical (no risk of float16 overflow).\n    return `\n    float ${funcName}(int row, int col,
int depth, int depth2, int depth3) {\n    float texR = dot(\n        vec4(row, col, depth, depth2),\n
vec4(${shape[1] * shape[2] * shape[3]},\n        ${shape[2] * shape[3]}, ${shape[3]}, 1));\n    int texC =
depth3;\n    vec2 uv = (vec2(texC, texR) + halfCR) /\n        vec2(${texNumC}.0, ${texNumR}.0);\n    return
sampleTexture(${texName}, uv);\n    }\n    `;\n    }\n\n    const offset =
getFlatOffsetUniformName(texName);\n    return `\n    float ${funcName}(int row, int col, int depth, int depth2, int
depth3) {\n    // Explicitly use integer operations as dot() only works on floats.\n    int index = row * ${stride0} +
col * ${stride1} + depth * ${stride2} +\n        depth2 * ${stride3} + depth3 + ${offset};\n    vec2 uv =
uvFromFlat(${texNumR}, ${texNumC}, index);\n    return sampleTexture(${texName}, uv);\n    }\n    `;\n}\n\nfunction getSampler6D(inputInfo: InputInfo): string {\n    const shape = inputInfo.shapeInfo.logicalShape;\n    const texName = inputInfo.name;\n    const funcName = 'get' + texName.charAt(0).toUpperCase() +
texName.slice(1);\n\n    const {newShape, keptDims} = util.squeezeShape(shape);\n    if (newShape.length <
shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n    const params = ['row', 'col',
'depth', 'depth2', 'depth3', 'depth4'];\n    return `\n    ${getSamplerFromInInfo(newInputInfo)}\n    float
${funcName}(int row, int col, int depth,\n        int depth2, int depth3, int depth4) {\n    return
${funcName}(${getSqueezedParams(params, keptDims)});\n    }\n    `;\n    }\n\n    const stride4 = shape[5];\n    const
stride3 = shape[4] * stride4;\n    const stride2 = shape[3] * stride3;\n    const stride1 = shape[2] * stride2;\n    const
stride0 = shape[1] * stride1;\n\n    if (inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505
(no risk of float16 overflow).\n    return `\n    float ${funcName}(int row, int col, int depth,\n        int depth2,
int depth3, int depth4) {\n    int index = round(dot(\n        vec4(row, col, depth, depth2),\n        vec4(${stride0},
${stride1}, ${stride2}, ${stride3})) +\n        dot(\n            vec2(depth3, depth4),\n            vec2(${stride4}, 1));\n
        ${getUniformSampler(inputInfo)}\n    }\n    `;\n    }\n\n    const flatOffset = inputInfo.shapeInfo.flatOffset;\n    const
texShape = inputInfo.shapeInfo.texShape;\n    const texNumR = texShape[0];\n    const texNumC = texShape[1];\n    if
(texNumC === stride0 && flatOffset === null) {\n    // texC is used directly as physical (no risk of float16
overflow).\n    return `\n    float ${funcName}(int row, int col, int depth,\n        int depth2, int depth3, int
depth4) {\n    int texR = row;\n    float texC = dot(vec4(col, depth, depth2, depth3),\n        vec4(${stride1},
${stride2}, ${stride3}, ${stride4})) +\n        float(depth4);\n    vec2 uv = (vec2(texC, texR) + halfCR) /\n
    }

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    vec2(${texNumC}.0, ${texNumR}.0);\n    return sampleTexture(${texName}, uv);\n  }\n  `;\n }\n if
(texNumC === stride4 && flatOffset === null) {\n  // texR is used directly as physical (no risk of float16
overflow).\n  return `float ${funcName}(int row, int col, int depth,\n    int depth2, int depth3, int
depth4) {\n    float texR = dot(vec4(row, col, depth, depth2),\n      vec4(${shape[1]} * shape[2] * shape[3] *
shape[4]),\n      ${shape[2]} * shape[3] * shape[4]),\n      ${shape[3]} * shape[4]),\n      ${shape[4]}) + float(depth3);\n    int texC = depth4;\n    vec2 uv = (vec2(texC, texR) + halfCR) /\n
vec2(${texNumC}.0, ${texNumR}.0);\n    return sampleTexture(${texName}, uv);\n  }\n  `;\n }\n const
offset = getFlatOffsetUniformName(texName);\n return `float ${funcName}(int row, int col, int depth,\n
  int depth2, int depth3, int depth4) {\n  // Explicitly use integer operations as dot() only works on floats.\n  int
index = row * ${stride0} + col * ${stride1} + depth * ${stride2} +\n    depth2 * ${stride3} + depth3 *
${stride4} + depth4 + ${offset};\n    vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index);\n    return
sampleTexture(${texName}, uv);\n  }\n  `;\n }\n\nfunction getUniformSampler(inputInfo: InputInfo): string {\n
const texName = inputInfo.name;\n const inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n\n if
(inSize < 2) {\n  return `return ${texName};`;\n }\n return `for (int i = 0; i < ${inSize}; i++) {\n  if (i ==
index) {\n    return ${texName}[i];\n  }\n }\n `;\n }\n\nfunction getPackedSamplerAtOutputCoords(\n
inputInfo: InputInfo, outShapeInfo: ShapeInfo) {\n  const texName = inputInfo.name;\n  const texFuncSnippet =
texName.charAt(0).toUpperCase() + texName.slice(1);\n  const funcName = 'get' + texFuncSnippet +
'AtOutCoords';\n  const inRank = inputInfo.shapeInfo.logicalShape.length;\n  const outRank =
outShapeInfo.logicalShape.length;\n\n  const broadcastDims = getBroadcastDims(\n
inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n\n  const type = getCoordsDataType(outRank);\n
const rankDiff = outRank - inRank;\n  let coordsSnippet: string;\n  const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n  if
(inRank === 0) {\n    coordsSnippet = ";\n  } else if (outRank < 2 && broadcastDims.length >= 1) {\n
coordsSnippet = 'coords = 0;'\n  } else {\n    coordsSnippet = `broadcastDims.map(d => `coords.${fields[d +
rankDiff]} = 0;`)\n      .join("\\n");\n  }\n  let unpackedCoordsSnippet = ";\n  if (outRank < 2 && inRank > 0) {\n
unpackedCoordsSnippet = 'coords';\n  } else {\n    unpackedCoordsSnippet = inputInfo.shapeInfo.logicalShape\n
      .map((s, i) => `coords.${fields[i + rankDiff]}`)\n      .join(', ');\n  }\n\n  let output =
`return outputValue;`;\n  const inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n  const
isInputScalar = inSize === 1;\n  const outSize = util.sizeFromShape(outShapeInfo.logicalShape);\n  const
isOutputScalar = outSize === 1;\n\n  if (inRank === 1 && !isInputScalar && !isOutputScalar) {\n    output = `
return vec4(outputValue.xy, outputValue.xy);\n  `;\n  } else if (isInputScalar && !isOutputScalar) {\n    if (outRank
=== 1) {\n      output = `return vec4(outputValue.x, outputValue.x, 0., 0.);`\n    } else {\n      output =
`return vec4(outputValue.x);\n  `;\n    }\n  } else if (broadcastDims.length) {\n    const rows = inRank - 2;\n
const cols = inRank - 1;\n    if (broadcastDims.indexOf(rows) > -1 && broadcastDims.indexOf(cols) > -1) {\n
output = `return vec4(outputValue.x);`\n    } else if (broadcastDims.indexOf(rows) > -1) {\n      output = `return
vec4(outputValue.x, outputValue.y, ` +\n      `outputValue.x, outputValue.y);`\n    } else if
(broadcastDims.indexOf(cols) > -1) {\n      output = `return vec4(outputValue.xx, outputValue.zz);`\n    }\n  }\n\n
return `return vec4 ${funcName}() {\n  ${type} coords = getOutputCoords();\n  ${coordsSnippet}\n  vec4
outputValue = get${texFuncSnippet}(${unpackedCoordsSnippet});\n  ${output}\n }\n `;\n }\n\nfunction
getSamplerAtOutputCoords(\n  inputInfo: InputInfo, outShapeInfo: ShapeInfo) {\n  const texName =
inputInfo.name;\n  const texFuncSnippet = texName.charAt(0).toUpperCase() + texName.slice(1);\n  const
funcName = 'get' + texFuncSnippet + 'AtOutCoords';\n  const outTexShape = outShapeInfo.texShape;\n  const
inTexShape = inputInfo.shapeInfo.texShape;\n  const inRank = inputInfo.shapeInfo.logicalShape.length;\n  const
outRank = outShapeInfo.logicalShape.length;\n\n  if (!inputInfo.shapeInfo.isUniform && inRank === outRank
&&\n    inputInfo.shapeInfo.flatOffset === null &&\n    util.arraysEqual(inTexShape, outTexShape)) {\n    return
`float ${funcName}() {\n    return sampleTexture(${texName}, resultUV);\n  }\n  `;\n }\n\n const type
= getCoordsDataType(outRank);\n  const broadcastDims = getBroadcastDims(\n
inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n  const rankDiff = outRank - inRank;\n  let
coordsSnippet: string;\n  const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n  if (inRank === 0) {\n    coordsSnippet = ";\n  }

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false);\n if (env().getNumber('WEBGL_VERSION') === 1) {\n   infLoc =
  gpgpu.getUniformLocation(webGLProgram, 'INFINITY', false);\n }\n\n // Add user-defined uniforms\n const
uniformLocations: {[name: string]: WebGLUniformLocation} = {};\n for (let i = 0; i <
  program.variableNames.length; i++) {\n   const varName = program.variableNames[i];\n   const shouldThrow =
  false;\n   uniformLocations[varName] =\n     gpgpu.getUniformLocation(webGLProgram, varName,
  shouldThrow);\n   uniformLocations['offset${varName}'] =\n     gpgpu.getUniformLocation(webGLProgram,
  `offset${varName}`, shouldThrow);\n }\n\n return {\n   program,\n   source,\n   webGLProgram,\n   uniformLocations,\n   inShapeInfos,\n   outShapeInfo,\n   infLoc,\n   nanLoc,\n   };\n}\n\nfunction
  validateBinaryAndProgram(\n   shapeInfos: ShapeInfo[], inputs: TensorData[]) {\n   if (shapeInfos.length !==
  inputs.length) {\n     throw Error(\n       `Binary was compiled with ${shapeInfos.length} inputs, but ` +\n       `was
  executed with ${inputs.length} inputs`);\n   }\n\n   shapeInfos.forEach((s, i) => {\n     const shapeA =
  s.logicalShape;\n     const input = inputs[i];\n     const shapeB = input.shape;\n\n     if (!util.arraysEqual(shapeA,
  shapeB)) {\n       throw Error(\n         `Binary was compiled with different shapes than ` +\n         `the current args.
  Shapes ${shapeA} and ${shapeB} must match`);\n     }\n\n     // The input is uploaded as uniform.\n     if (s.isUniform
  && input.isUniform) {\n       return;\n     }\n\n     const texShapeA = s.texShape;\n     const texShapeB =
  input.isUniform ? null : input.texData.texShape;\n     if (!util.arraysEqual(texShapeA, texShapeB)) {\n       throw
  Error(\n         `Binary was compiled with different texture shapes than the ` +\n         `current args. Shape
  ${texShapeA} and ${texShapeB} must match`);\n     }\n   });\n}\n\nexport function runProgram<T extends Tensor, K
  extends Tensor>(\n   gpgpu: GPGPUContext, binary: GPGPUBinary, inputs: TensorData[],\n   output:
  TensorData,\n   customSetup?: (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) =>\n     void): void
  {\n   validateBinaryAndProgram(binary.inShapeInfos, inputs);\n   validateBinaryAndProgram([binary.outShapeInfo],
  [output]);\n\n   const outTex = output.texData.texture;\n   const outTexShape = output.texData.texShape;\n   if
  (output.texData.isPacked) {\n     gpgpu.setOutputPackedMatrixTexture(outTex, outTexShape[0], outTexShape[1]);\n   }
  else {\n     gpgpu.setOutputMatrixTexture(outTex, outTexShape[0], outTexShape[1]);\n   }\n\n   gpgpu.setProgram(binary.webGLProgram);\n\n   // Set special uniforms (NAN, INFINITY)\n   if
  (env().getNumber('WEBGL_VERSION') === 1) {\n     if (binary.infLoc !== null) {\n       gpgpu.gl.uniform1f(binary.infLoc, Infinity);\n     }\n     if (binary.nanLoc !== null) {\n       gpgpu.gl.uniform1f(binary.nanLoc, NaN);\n     }\n\n     // Set user-defined inputs\n     inputs.forEach((input, i) => {\n       const varName = binary.program.variableNames[i];\n       const varLoc = binary.uniformLocations[varName];\n       const varOffsetLoc = binary.uniformLocations['offset${varName}'];\n\n       if (varLoc == null) {\n         // The
  compiler inferred that this variable is not used in this shader.\n         return;\n       }\n\n       if (input.isUniform) {\n         //
  Upload the values of the tensor as uniform.\n         if (util.sizeFromShape(input.shape) < 2) {\n           gpgpu.gl.uniform1f(varLoc, input.uniformValues[0]);\n         } else {\n           let vals = input.uniformValues;\n           if
  (!(vals instanceof Float32Array)) {\n             vals = new Float32Array(vals);\n           }\n           gpgpu.gl.uniform1fv(varLoc, vals);\n         }\n         return;\n       }\n\n       // If the input was sliced, upload the flat offset
  index.\n       if (input.texData.slice != null && varOffsetLoc != null) {\n         gpgpu.gl.uniform1i(varOffsetLoc,
  input.texData.slice.flatOffset);\n       }\n       gpgpu.setInputMatrixTexture(input.texData.texture, varLoc, i);\n     });\n\n     if (customSetup != null) {\n       customSetup(gpgpu, binary.webGLProgram);\n     }\n\n     gpgpu.executeProgram();\n   }\n}\n\nexport function makeShaderKey(\n   program: GPGPUProgram, inputs:
  TensorData[], output: TensorData): string {\n   let keyInputs = ";\n   inputs.concat(output).forEach(x => {\n     const
  hasOffset = x.texData != null && x.texData.slice != null &&\n       x.texData.slice.flatOffset > 0;\n     const
  texShape = x.isUniform ? 'uniform' : x.texData.texShape;\n     keyInputs +=
  `${x.shape}_${texShape}_${hasOffset}`;\n   });\n   const keyUserCode = program.userCode;\n   let key =
  program.constructor.name;\n   // Fast string concat. See https://jsperf.com/string-concatenation/14.\n   key += '_' +
  keyInputs + '_' + keyUserCode;\n   return key;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
  Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\n\nexport function assertNotComplex(\n  tensor: TensorInfo|TensorInfo[], opName: string): void {\n  if (!Array.isArray(tensor)) {\n    tensor = [tensor];\n  }\n  tensor.forEach(t => {\n    if (t != null) {\n      util.assert(\n        t.dtype !== 'complex64',\n        () => `${\n          opName\n        } does not support complex64 tensors in the CPU backend.`);\n    }\n  });\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific\n * language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {Abs, AbsInputs, KernelConfig, KernelFunc, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\n\nexport function simpleAbsImpl(vals: TypedArray): Float32Array {\n  const resultValues = new Float32Array(vals.length);\n  for (let i = 0; i < vals.length; ++i) {\n    resultValues[i] = Math.abs(vals[i]);\n  }\n  return resultValues;\n}\n\nexport const abs = (args: {inputs: AbsInputs, backend: MathBackendCPU}) => {\n  const {x} = args.inputs;\n  const cpuBackend = args.backend;\n  assertNotComplex(x, 'abs');\n  let resultValues = new Float32Array(util.sizeFromShape(x.shape));\n  const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n  resultValues = simpleAbsImpl(values);\n  return cpuBackend.makeOutput(resultValues, x.shape, 'float32');\n};\n\nexport const absConfig: KernelConfig = {\n  kernelName: Abs,\n  backendName: 'cpu',\n  kernelFunc: abs as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, DataType, NumericDataType, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {SimpleBinaryKernelImpl, SimpleBinaryOperation} from './binary_types';\n\n/**\n * Template that creates implementation for binary ops. Supports broadcast.\n */\nexport function createSimpleBinaryKernelImpl(op: SimpleBinaryOperation):\n  SimpleBinaryKernelImpl {\n  return (aShape: number[], bShape: number[], aVals: TypedArray,\n    bVals: TypedArray, dtype: DataType): [TypedArray, number[]] => {\n    const newShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    const resultRank = newShape.length;\n    const resultStrides = util.computeStrides(newShape);\n    const resultSize = util.sizeFromShape(newShape);\n    const result =\n      util.getTypedArrayFromDType(dtype as NumericDataType, resultSize);\n    const aRank = aShape.length;\n    const bRank = bShape.length;\n    const aStrides = util.computeStrides(aShape);\n    const bStrides = util.computeStrides(bShape);\n    const aBroadcastDims = backend_util.getBroadcastDims(aShape, newShape);\n    const bBroadcastDims = backend_util.getBroadcastDims(bShape, newShape);\n    if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n      for (let i = 0; i < result.length; ++i) {\n        result[i] = op(aVals[i % aVals.length], bVals[i % bVals.length]);\n      }\n    } else {\n      for (let i = 0; i < result.length; ++i) {\n        const loc = util.indexToLoc(i, resultRank, resultStrides);\n        const aLoc = loc.slice(-aRank);\n        aBroadcastDims.forEach(d => aLoc[d] = 0);\n        const aIndex = util.locToIndex(aLoc, aRank, aStrides);\n        const bLoc = loc.slice(-bRank);\n        bBroadcastDims.forEach(d => bLoc[d] = 0);\n        const
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bIndex = util.locToIndex(bLoc, bRank, bStrides);\n      result[i] = op(aVals[aIndex], bVals[bIndex]);\n    }\n  }\n  return [result, newShape];\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Complex, ComplexInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\n\nexport function complex(args: {inputs: ComplexInputs, backend: MathBackendCPU}): TensorInfo {\n  const {inputs, backend} = args;\n  const {real, imag} = inputs;\n  const realVals = backend.data.get(real.dataId).values as TypedArray;\n  const imagVals = backend.data.get(imag.dataId).values as TypedArray;\n  const complexInfo = backend.makeTensorInfo(real.shape, 'complex64');\n  const complex = backend.data.get(complexInfo.dataId);\n  // The complex tensor owns the underlying real and imag tensorInfos, only the\n  // complex tensor tracks refCount, when complexData is disposed the\n  // underlying tensorData will be disposed.\n  complex.complexTensorInfos = {\n    real: backend.makeTensorInfo(real.shape, 'float32', realVals),\n    imag: backend.makeTensorInfo(imag.shape, 'float32', imagVals)\n  };\n  return complexInfo;\n}\n\nexport const complexConfig: KernelConfig = {\n  kernelName: Complex,\n  backendName: 'cpu',\n  kernelFunc: complex as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {DataType, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\nimport {complex} from './kernels/Complex';\n\n/*\n * Generates a tensorInfo with all zeros value.\n * @param backend cpu backend.\n * @param shape Shape for the zeros tensor.\n * @param dtype Optional. If set, the result has this dtype.\n */\nexport function zeros(\n  backend: MathBackendCPU, shape: number[],\n  dtype: DataType = 'float32'): TensorInfo {\n  if (dtype === 'complex64') {\n    const real = zeros(backend, shape, 'float32');\n    const imag = zeros(backend, shape, 'float32');\n    return complex({inputs: {real, imag}, backend});\n  }\n  const values = util.makeZerosTypedArray(util.sizeFromShape(shape), dtype);\n  return backend.makeTensorInfo(shape, dtype, values);\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\n\nexport function identity(\n  args: {inputs: IdentityInputs, backend: MathBackendCPU}): TensorInfo {\n  const {inputs, backend} = args;\n  const {x} = inputs;\n  backend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: x.shape, dtype: x.dtype};\n}\n\nexport const identityConfig: KernelConfig = {\n  kernelName: Identity,\n  backendName: 'cpu',\n  kernelFunc: identity as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed

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=====  
*  
\nimport {KernelConfig, KernelFunc, Real, RealInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport  
{MathBackendCPU} from '../backend_cpu';\nexport function real(args: {inputs: RealInputs, backend:  
MathBackendCPU}):  
TensorInfo {\n  const {inputs, backend} = args;\n  const {input} = inputs;\n  const real =  
backend.data.get(input.dataId).complexTensorInfos.real;\n  const realVal = backend.data.get(real.dataId).values;\n  // When complex tensor is disposed, its underlying parts will be disposed too. // Make new tensor out of the real  
value of the complex. This makes sure the // value is still accessible even if complex tensor is disposed.\n  return  
backend.makeTensorInfo(real.shape, real.dtype, realVal);\n}\nexport const realConfig: KernelConfig = {\n  kernelName: Real,\n  backendName: 'cpu',\n  kernelFunc: real as { } as KernelFunc\n};\n"/**\n * @license  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n */
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=====  
*  
\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray, util} from  
'@tensorflow/tfjs-core';\nimport {MathBackendCPU} from '../backend_cpu';\nimport  
{createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {zeros} from '../utils/zeros_impl';\nimport  
{complex} from './Complex';\nimport {identity} from './Identity';\nimport {real} from './Real';\nexport function  
cast(\n  args: {inputs: CastInputs, backend: MathBackendCPU, attrs: CastAttrs}):  
TensorInfo {\n  const  
{inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {dtype} = attrs;\n  // Casting to complex64.\n  if  
(dtype === 'complex64') {\n    if (x.dtype === 'complex64') {\n      return identity({inputs: {x}, backend});\n    }\n    const zerosTensorInfo = zeros(backend, x.shape, x.dtype);\n    const floatX = cast({inputs: {x}, backend, attrs:  
{dtype: 'float32'}});\n    const result =\n      complex({inputs: {real: floatX, imag: zerosTensorInfo},  
backend});\n    backend.disposeIntermediateTensorInfo(zerosTensorInfo);\n    backend.disposeIntermediateTensorInfo(floatX);\n    return result;\n  }\n  // Casting from complex64\n  if  
(x.dtype === 'complex64') {\n    const realPart = real({inputs: {input: x}, backend});\n    const result = cast({inputs:  
{x: realPart}, backend, attrs: {dtype}});\n    backend.disposeIntermediateTensorInfo(realPart);\n    return  
result;\n  }\n  if (!util.hasEncodingLoss(x.dtype, dtype)) {\n    // We don't change the underlying data, since we  
cast to higher // precision.\n    const result = identity({inputs: {x}, backend});\n    return {dataId: result.dataId,  
shape: result.shape, dtype};\n  }\n  if (dtype === 'int32') {\n    const values = backend.data.get(x.dataId).values as  
TypedArray;\n    const resultValues = Int32Array.from(values);\n    return backend.makeTensorInfo(x.shape, 'int32',  
resultValues);\n  }\n  if (dtype === 'bool') {\n    // This is essentially the result of notEqual(x, 0). We avoid using\n    // kernel notEqual to avoid circular dependency, i.e. binary_utils -> // cast -> notEqual -> binary_utils.\n    const xVals = backend.data.get(x.dataId).values as TypedArray;\n    const zero = util.toTypedArray([0,  
x.dtype]);\n    const [resultData, resultShape] = createSimpleBinaryKernelImpl(\n      (a, b) => (a !== b) ? 1 :  
0)(x.shape, [], xVals, zero, 'bool');\n    return backend.makeTensorInfo(resultShape, 'bool', resultData);\n  }\n  throw new Error(`Error in Cast: failed to cast ${x.dtype} to ${dtype}`);\n}\nexport const castConfig:  
KernelConfig = {\n  kernelName: Cast,\n  backendName: 'cpu',\n  kernelFunc: cast as { } as  
KernelFunc\n};\n"/**\n * @license  
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*\n\nimport {backend_util, BinaryInputs, DataType, KernelFunc, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\nimport {cast} from '../kernels/Cast';\nimport {complex} from '../kernels/Complex';\nimport {ComplexBinaryKernelImpl, ComplexBinaryOperation, SimpleBinaryKernelImpl} from '../binary_types';\n\n/**\n * Template that creates a `KernelFunc` for binary ops.\n * @param name Kernel name.\n * @param binaryKernelImpl A `SimpleBinaryKernelImpl` for the kernel.\n * @param binaryKernelComplexImpl Optional. If exists, represents a\n * `ComplexBinaryKernelImpl` for the kernel, will be used when input dtype\n * is `complex64`.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same dtype as the first input. This is mainly used in\n * comparison kernels, such as Equal, Less, Greater, etc.\n */\nexport function binaryKernelFunc(\n  name: string, simpleImpl: SimpleBinaryKernelImpl, complexImpl?:\n  ComplexBinaryKernelImpl, dtype?: DataType): KernelFunc {\n  if (complexImpl == null) {\n    return ({inputs, backend}) => {\n      const {a, b} = inputs as BinaryInputs;\n      const cpuBackend = backend as MathBackendCPU;\n\n      assertNotComplex([a, b], name);\n      const aVals = cpuBackend.data.get(a.dataId).values as TypedArray;\n      const bVals = cpuBackend.data.get(b.dataId).values as TypedArray;\n      const $dtype = dtype || a.dtype;\n      const [resultData, resultShape] =\n        simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n      return cpuBackend.makeTensorInfo(resultShape, $dtype, resultData);\n    }; \n  } \n  return ({inputs, backend}) => {\n    const {a, b} = inputs as BinaryInputs;\n    const cpuBackend = backend as MathBackendCPU;\n    if (a.dtype === 'complex64' || b.dtype === 'complex64') {\n      const $aComplex = cast(\n        {inputs: {x: a}, backend: cpuBackend, attrs: {dtype: 'complex64'}});\n      const $aComplexVals = cpuBackend.data.get($aComplex.dataId);\n      const aReal = $aComplexVals.complexTensorInfos.real;\n      const aImag = $aComplexVals.complexTensorInfos.imag;\n      const aRealVals =\n        cpuBackend.data.get(aReal.dataId).values as Float32Array;\n      const aImagVals =\n        cpuBackend.data.get(aImag.dataId).values as Float32Array;\n      const $bComplex = cast(\n        {inputs: {x: b}, backend: cpuBackend, attrs: {dtype: 'complex64'}});\n      const $bComplexVals =\n        cpuBackend.data.get($bComplex.dataId);\n      const bReal = $bComplexVals.complexTensorInfos.real;\n      const bImag = $bComplexVals.complexTensorInfos.imag;\n      const bRealVals =\n        cpuBackend.data.get(bReal.dataId).values as Float32Array;\n      const bImagVals =\n        cpuBackend.data.get(bImag.dataId).values as Float32Array;\n      const [resultRealData, resultImagData, resultShape] =\n        complexImpl(\n          a.shape, b.shape, aRealVals, aImagVals, bRealVals, bImagVals);\n      const resultReal =\n        cpuBackend.makeTensorInfo(resultShape, 'float32', resultRealData);\n      const resultImag =\n        cpuBackend.makeTensorInfo(resultShape, 'float32', resultImagData);\n      const result = complex(\n        {inputs: {real: resultReal, imag: resultImag}, backend: cpuBackend});\n      cpuBackend.disposeIntermediateTensorInfo($aComplex);\n      cpuBackend.disposeIntermediateTensorInfo($bComplex);\n      cpuBackend.disposeIntermediateTensorInfo(resultReal);\n      cpuBackend.disposeIntermediateTensorInfo(resultImag);\n      return result;\n    } else {\n      const aVals =\n        cpuBackend.data.get(a.dataId).values as TypedArray;\n      const bVals = cpuBackend.data.get(b.dataId).values as TypedArray;\n      const $dtype = dtype || a.dtype;\n      const [resultData, resultShape] =\n        simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n      return cpuBackend.makeTensorInfo(resultShape, $dtype, resultData);\n    } \n  }; \n} \n\n/**\n * Template that creates the complex type implementation for binary ops.\n * Supports broadcast.\n */\nexport function createComplexBinaryKernelImpl(op: ComplexBinaryOperation):\n  ComplexBinaryKernelImpl {\n  return (aShape: number[], bShape: number[], aRealVals: Float32Array,\n
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aImagVals: Float32Array, bRealVals: Float32Array,\n      bImagVals: Float32Array): [TypedArray, TypedArray,
number[]] => {\n  const resultShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n  const
resultSize = util.sizeFromShape(resultShape);\n  const resultRank = resultShape.length;\n  const resultStrides =
util.computeStrides(resultShape);\n  const resultRealVals = util.getTypedArrayFromDType('float32',
resultSize);\n  const resultImagVals = util.getTypedArrayFromDType('float32', resultSize);\n  const
aBroadcastDims = backend_util.getBroadcastDims(aShape, resultShape);\n  const bBroadcastDims =
backend_util.getBroadcastDims(bShape, resultShape);\n  const aVals =
backend_util.mergeRealAndImagArrays(aRealVals, aImagVals);\n  const bVals =
backend_util.mergeRealAndImagArrays(bRealVals, bImagVals);\n  const aRank = aShape.length;\n  const
aStrides = util.computeStrides(aShape);\n  const bRank = bShape.length;\n  const bStrides =
util.computeStrides(bShape);\n  if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n    for (let i = 0;
i < resultRealVals.length; i++) {\n      const aIdx = i % aVals.length;\n      const bIdx = i % bVals.length;\n      const result =\n        op(aVals[aIdx * 2], aVals[aIdx * 2 + 1], bVals[bIdx * 2],\n          bVals[bIdx * 2 + 1]);\n      resultRealVals[i] = result.real;\n      resultImagVals[i] = result.imag;\n    }\n  } else {\n    for (let i = 0; i <
resultRealVals.length; i++) {\n      const loc = util.indexToLoc(i, resultRank, resultStrides);\n      const aLoc =
loc.slice(-aRank);\n      aBroadcastDims.forEach(d => aLoc[d] = 0);\n      const aIndex = util.locToIndex(aLoc,
aRank, aStrides);\n      const bLoc = loc.slice(-bRank);\n      bBroadcastDims.forEach(d => bLoc[d] = 0);\n      const bIndex = util.locToIndex(bLoc, bRank, bStrides);\n      const opResult =\n        op(aVals[aIndex * 2],\n          aVals[aIndex * 2 + 1], bVals[bIndex * 2],\n          bVals[bIndex * 2 + 1]);\n      resultRealVals[i] =
opResult.real;\n      resultImagVals[i] = opResult.imag;\n    }\n  }\n  return [resultRealVals, resultImagVals,
resultShape];\n};\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *

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*\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl} from
'./utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from
'./utils/binary_utils';\n\nexport const addImpl = createSimpleBinaryKernelImpl(((a, b) => a + b));\n\nexport const
addComplexImpl =\n  createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) => {\n    return {real:
aReal + bReal, imag: aImag + bImag};\n  }));\n\nexport const add = binaryKernelFunc(Add, addImpl,
addComplexImpl);\n\nexport const addConfig: KernelConfig = {\n  kernelName: Add,\n  backendName: 'cpu',\n  kernelFunc: add\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {buffer, DataType, Rank, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport
function bincountImpl(\n  xVals: TypedArray, weightsVals: TypedArray, weightsDtype: DataType,\n  weightsShape: number[], size: number): TypedArray {\n  const weightsSize = util.sizeFromShape(weightsShape);\n  const outVals = util.makeZerosTypedArray(size, weightsDtype) as TypedArray;\n  for (let i = 0; i < xVals.length;
i++) {\n    const value = xVals[i];\n    if (value < 0) {\n      throw new Error('Input x must be non-negative!');\n    }\n    if (value >= size) {\n      continue;\n    }\n    if (weightsSize > 0) {\n      outVals[value] +=

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weightsVals[i];\n } else {\n   outVals[value] += 1;\n }\n }\n\n return outVals;\n}\n\nexport function
bincountReduceImpl<R extends Rank>(\n  xBuf: TensorBuffer<R>, weightsBuf: TensorBuffer<R>, size:
number,\n  binaryOutput = false): TensorBuffer<R> {\n  const numRows = xBuf.shape[0];\n  const numCols =
xBuf.shape[1];\n  const outBuf = buffer([numRows, size], weightsBuf.dtype);\n\n  for (let i = 0; i < numRows;
i++) {\n    for (let j = 0; j < numCols; j++) {\n      const value = xBuf.get(i, j);\n      if (value < 0) {\n        throw new
Error('Input x must be non-negative!');\n      }\n\n      if (value >= size) {\n        continue;\n      }\n\n      if
(binaryOutput) {\n        outBuf.set(1, i, value);\n      } else {\n        if (weightsBuf.size > 0) {\n
outBuf.set(outBuf.get(i, value) + weightsBuf.get(i, j), i, value);\n        } else {\n          outBuf.set(outBuf.get(i, value)
+ 1, i, value);\n        }\n      }\n\n    }\n  }\n\n  return outBuf as TensorBuffer<R>;\n}\n\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*\n\nimport {NumericDataType, util} from '@tensorflow/tfjs-core';\n\nimport {SimpleUnaryImpl,
SimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates implementation for unary op.\n
*\nexport function createSimpleUnaryImpl(op: SimpleUnaryOperation):\n  SimpleUnaryImpl {\n  return (values,
dtype, attrs) => {\n    const newValues =\n      util.getTypedArrayFromDType(dtype as NumericDataType,
values.length);\n    for (let i = 0; i < values.length; ++i) {\n      newValues[i] = op(values[i], attrs);\n    }\n    return
newValues;\n  };\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

```

```

=====\n
*\n\nimport {DataType, KernelFunc, TypedArray, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex} from './cpu_util';\n\nimport
{SimpleUnaryImpl, SimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates a `KernelFunc`
for unary ops.\n * @param name Kernel name.\n * @param op A `SimpleUnaryOperation` for the kernel.\n *
@param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same dtype as the input.
This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf, etc.\n *\nexport function
unaryKernelFunc(\n  name: string, op: SimpleUnaryOperation, dtype?: DataType): KernelFunc {\n  return
({inputs, attrs, backend}) => {\n    const {x} = inputs as UnaryInputs;\n    assertNotComplex(x, name);\n    if
(x.dtype === 'string' || dtype === 'string') {\n      throw new Error('unaryKernelFunc does not support string
input/output');\n    }\n\n    const cpuBackend = backend as MathBackendCPU;\n    const values =
cpuBackend.data.get(x.dataId).values as TypedArray;\n    const xSize = util.sizeFromShape(x.shape);\n    const
$dtype = dtype || x.dtype;\n    const newValues = util.getArrayFromDType($dtype, xSize);\n    for (let i = 0; i <
xSize; ++i) {\n      newValues[i] = op(values[i], attrs);\n    }\n    return cpuBackend.makeTensorInfo(x.shape,
$dtype, newValues);\n  };\n}\n\n/**\n * Template that creates a `KernelFunc` for unary ops from the given\n *
`SimpleUnaryImpl`.\n * @param name Kernel name.\n * @param unaryImpl A `SimpleUnaryImpl` that
implements the op.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the
same dtype as the input. This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf,
etc.\n *\nexport function unaryKernelFuncFromImpl(\n  name: string, unaryImpl: SimpleUnaryImpl, dtype?:
DataType): KernelFunc {\n  return ({inputs, attrs, backend}) => {\n    const {x} = inputs as UnaryInputs;\n

```

```

assertNotComplex(x, name);\n  if (x.dtype === 'string' || dtype === 'string') {\n    throw new
Error('unaryKernelFunc does not support string input/output');\n  }\n\n  const cpuBackend = backend as
MathBackendCPU;\n  const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n  const $dtype =
dtype || x.dtype;\n  const newValues = unaryImpl(values, $dtype, attrs);\n  return
cpuBackend.makeTensorInfo(x.shape, $dtype, newValues);\n };\n\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may
not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR
CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Ceil, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from
'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\nexport const ceilImpl =
createSimpleUnaryImpl((xi) => Math.ceil(xi));\n\nexport const ceil = unaryKernelFuncFromImpl(Ceil,
ceilImpl);\n\nexport const ceilConfig: KernelConfig = {\n  kernelName: Ceil,\n  backendName: 'cpu',\n  kernelFunc:
ceil,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the 'License');\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an 'AS IS'\n
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, BackendValues, DataType, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport
function concatImpl(\n  inputs: Array<{vals: BackendValues, shape: number[]}>, outShape: number[],\n  dtype:
DataType, simplyConcat: boolean): TypedArray|string[] {\n  const outVals = util.getArrayFromDType(dtype,
util.sizeFromShape(outShape));\n\n  if (simplyConcat && dtype !== 'string') {\n    // Use built-in TypedArray.set()
method for speed.\n    let offset = 0;\n    inputs.forEach(input => {\n      const size =
util.sizeFromShape(input.shape);\n      (outVals as TypedArray).set(input.vals as TypedArray, offset);\n      offset
+= size;\n    });\n  } else {\n    let colOffset = 0;\n    inputs.forEach(input => {\n      const decodedData = dtype
=== 'string' ?\n        backend_util.fromUint8ToStringArray(input.vals as Uint8Array[]) :\n        input.vals as
TypedArray;\n      let tIdx = 0;\n      for (let row = 0; row < input.shape[0]; ++row) {\n        const resIdx = row *
outShape[1] + colOffset;\n        for (let col = 0; col < input.shape[1]; ++col) {\n          outVals[resIdx + col] =
decodedData[tIdx++];\n        }\n        colOffset += input.shape[1];\n      });\n    }\n\n    return
outVals;\n  }\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n *
You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless
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IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See
the License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from
'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\nexport const expImpl =
createSimpleUnaryImpl((xi) => Math.exp(xi));\n\nexport const exp = unaryKernelFuncFromImpl(Exp,
expImpl);\n\nexport const expConfig: KernelConfig = {\n  kernelName: Exp,\n  backendName: 'cpu',\n  kernelFunc:
exp,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required

```


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BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the
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```
=====  
*\n\nimport {Expml, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from\n'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\nexport const expmlImpl =\ncreateSimpleUnaryImpl((xi) => Math.expml(xi));\n\nexport const expml = unaryKernelFuncFromImpl(Expml,\nexpmlImpl);\n\nexport const expmlConfig: KernelConfig = {\n  kernelName: Expml,\n  backendName: 'cpu',\n  kernelFunc: expml,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n=====  
*\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from\n'./utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\nexport const floorImpl =\ncreateSimpleUnaryImpl((xi) => Math.floor(xi));\n\nexport const floor = unaryKernelFuncFromImpl(Floor,\nfloorImpl);\n\nexport const floorConfig: KernelConfig = {\n  kernelName: Floor,\n  backendName: 'cpu',\n  kernelFunc: floor,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n=====  
*\n\nimport {buffer, DataType, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\nexport function\ngatherV2Impl<R extends Rank, D extends DataType>(\n  xBuf: TensorBuffer<R, D>, indicesBuf:\nTensorBuffer<R, D>,\n  flattenOutputShape: number[]): TensorBuffer<R, D> {\n  const outBuf =\nbuffer(flattenOutputShape, xBuf.dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const newLoc =\noutBuf.indexToLoc(i);\n\n    const originalLoc: number[] = newLoc.slice();\n    const batchIdx = originalLoc[0];\n    const indicesIdx = originalLoc[2];\n    const indicesIndex = indicesBuf.locToIndex([batchIdx, indicesIdx]);\n    originalLoc[2] = indicesBuf.values[indicesIndex] as number;\n\n    const originalIndex =\nxBuf.locToIndex(originalLoc);\n    outBuf.values[i] = xBuf.values[originalIndex];\n  }\n\n  return outBuf as\nTensorBuffer<R, D>;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n */\n=====  
*\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}\nfrom './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const greaterImpl =\ncreateSimpleBinaryKernelImpl((a: number, b: number) => (a > b) ? 1 : 0);\n\nexport const greater =\nbinaryKernelFunc(Greater, greaterImpl, null /* complexImpl */, 'bool');\n\nexport const greaterConfig:
```

KernelConfig = {\n kernelName: Greater,\n backendName: 'cpu',\n kernelFunc: greater\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, Less } from '@tensorflow/tfjs-core';\nimport { createSimpleBinaryKernelImpl } from\n './utils/binary_impl';\nimport { binaryKernelFunc } from './utils/binary_utils';\n\nexport const lessImpl =\n createSimpleBinaryKernelImpl((a: number, b: number) => (a < b) ? 1 : 0);\nexport const less =\n binaryKernelFunc(Less, lessImpl, null /* complexImpl */, 'bool');\n\nexport const lessConfig: KernelConfig = {\n kernelName: Less,\n backendName: 'cpu',\n kernelFunc: less\n};\n", "/*\n * @license\n * Copyright 2020 Google\n * LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not\n * use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { TypedArray, util } from '@tensorflow/tfjs-core';\n\nexport function linspaceImpl(\n  start: number,\n  stop: number, num: number): TypedArray {\n  const step = (stop - start) / (num - 1);\n  const values =\n    util.makeZerosTypedArray(num, 'float32');\n  values[0] = start;\n  for (let i = 1; i < values.length; i++) {\n    values[i] = values[i - 1] + step;\n  }\n  return values;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * License);\n * you may not use this file\n * except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an\n * AS IS BASIS,\n * WITHOUT WARRANTIES OR\n * CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing\n * permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Log } from '@tensorflow/tfjs-core';\nimport { createSimpleUnaryImpl } from\n './utils/unary_impl';\nimport { unaryKernelFuncFromImpl } from './utils/unary_utils';\n\nexport const logImpl =\n createSimpleUnaryImpl((xi) => Math.log(xi));\nexport const log = unaryKernelFuncFromImpl(Log,\n logImpl);\n\nexport const logConfig: KernelConfig = {\n kernelName: Log,\n backendName: 'cpu',\n kernelFunc:\n log,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n * License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You\n * may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n * by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n * License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { DataType, NumericDataType, TypedArray, util } from '@tensorflow/tfjs-core';\n\nexport function\n maxImpl(\n  aVals: TypedArray, reduceSize: number, outShape: number[],\n  dtype: DataType): TypedArray {\n  const vals = util.getTypedArrayFromDType(\n    dtype as NumericDataType, util.sizeFromShape(outShape));\n  for (let i = 0; i < vals.length; ++i) {\n    const offset = i * reduceSize;\n    let max = aVals[offset];\n    for (let j = 0; j\n < reduceSize; ++j) {\n      const value = aVals[offset + j];\n      if (value > max) {\n        max = value;\n      }\n    }\n    vals[i] = max;\n  }\n  return vals;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
```

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```
=====  
*\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}\nfrom './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const maximumImpl =\ncreateSimpleBinaryKernelImpl(\n  ((aValue, bValue) => Math.max(aValue, bValue)));\nexport const maximum =\nbinaryKernelFunc(Maximum, maximumImpl);\n\nexport const maximumConfig: KernelConfig = {\n  kernelName:\nMaximum,\n  backendName: 'cpu',\n  kernelFunc: maximum\n};\n\n"/**\n * @license\n * Copyright 2020 Google\nLLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\nuse this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\nhttp://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an "AS IS"\nBASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}\nfrom './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const minimumImpl =\ncreateSimpleBinaryKernelImpl(\n  ((aValue, bValue) => Math.min(aValue, bValue)));\nexport const minimum =\nbinaryKernelFunc(Minimum, minimumImpl);\n\nexport const minimumConfig: KernelConfig = {\n  kernelName:\nMinimum,\n  backendName: 'cpu',\n  kernelFunc: minimum\n};\n\n"/**\n * @license\n * Copyright 2020 Google\nLLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not\nuse this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\nhttp://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an "AS IS"\nBASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl}\nfrom './utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from\n './utils/binary_utils';\n\nexport const multiplyImpl =\ncreateSimpleBinaryKernelImpl(((aValue, bValue) =>\naValue * bValue));\nexport const multiplyComplexImpl =\ncreateComplexBinaryKernelImpl(((aReal, aImag,\nbReal, bImag) => {\n  return {\n    real: aReal * bReal - aImag * bImag,\n    imag: aReal * bImag + aImag *\nbReal\n  };\n}));\n\nexport const multiply =\nbinaryKernelFunc(Multiply, multiplyImpl,\nmultiplyComplexImpl);\n\nexport const multiplyConfig: KernelConfig = {\n  kernelName: Multiply,\n  backendName: 'cpu',\n  kernelFunc: multiply\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\nReserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\nexcept in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\nhttp://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\nsoftware\n * distributed under the License is distributed on an "AS IS"\nBASIS,\n * WITHOUT WARRANTIES\nOR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {DataType, KernelConfig, KernelFunc, Neg, TensorInfo, TypedArray, UnaryInputs, util} from\n '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex} from
```

```

./cpu_util';\nimport {multiplyImpl} from './Multiply';\n\nexport function negImpl(xVals: TypedArray, xShape:
number[], xDtype: DataType):\n  [TypedArray, number[]] {\n    const minusOne =\n      util.createScalarValue(-1 as
{ } as 'float32', xDtype) as TypedArray;\n    return multiplyImpl([], xShape, minusOne, xVals, xDtype);\n  }\n\nexport
function neg(args: {inputs: UnaryInputs, backend: MathBackendCPU}):\n  TensorInfo {\n    const {inputs,
backend} = args;\n    const {x} = inputs;\n    assertNotComplex(x, 'neg');\n    const xVals =
backend.data.get(x.dataId).values as TypedArray;\n    const [res, newShape] = negImpl(xVals, x.shape, x.dtype);\n    return backend.makeTensorInfo(newShape, x.dtype, res);\n  }\n\nexport const negConfig: KernelConfig = {\n
kernelName: Neg,\n  backendName: 'cpu',\n  kernelFunc: neg as { } as KernelFunc\n};\n\n"/**\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl}
from './utils/binary_impl';\nimport {binaryKernelFunc} from './utils/binary_utils';\n\nexport const notEqualImpl
=\n  createSimpleBinaryKernelImpl(((a, b) => (a !== b) ? 1 : 0));\n\nexport const notEqual =\n  binaryKernelFunc(NotEqual, notEqualImpl, null /* complexOp */, 'bool');\n\nexport const notEqualConfig:
KernelConfig = {\n  kernelName: NotEqual,\n  backendName: 'cpu',\n  kernelFunc: notEqual\n};\n\n"/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {DataType, NumericDataType, TypedArray} from '@tensorflow/tfjs-core';\nimport {util} from
'@tensorflow/tfjs-core';\n\nexport function transposeImpl(\n  xVals: TypedArray, xShape: number[], dtype:
DataType, perm: number[],\n  newShape: number[]): TypedArray {\n  const xRank = xShape.length;\n  const xSize
= util.sizeFromShape(xShape);\n  const xStrides = util.computeStrides(xShape);\n  const newStrides =
util.computeStrides(newShape);\n\n  const result = util.getTypedArrayFromDType(\n    dtype as
NumericDataType, util.sizeFromShape(newShape));\n\n  for (let i = 0; i < xSize; ++i) {\n    const loc =
util.indexToLoc(i, xRank, xStrides);\n\n    // Permute location.\n    const newLoc: number[] = new
Array(loc.length);\n    for (let i = 0; i < newLoc.length; i++) {\n      newLoc[i] = loc[perm[i]];\n    }\n\n    const
newIndex = util.locToIndex(newLoc, xRank, newStrides);\n    result[newIndex] = xVals[i];\n  }\n  return
result;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs, TypedArray}
from '@tensorflow/tfjs-core';\nimport {MathBackendCPU} from './backend_cpu';\nimport {assertNotComplex}
from './cpu_util';\nimport {transposeImpl} from './Transpose_impl';\n\nexport function transpose(args: {\n  inputs:
TransposeInputs,\n  attrs: TransposeAttrs,\n  backend: MathBackendCPU\n}): TensorInfo {\n  const {inputs, attrs,

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backend} = args;\n const {x} = inputs;\n const {perm} = attrs;\n\n assertNotComplex(x, 'transpose');\n\n const
xRank = x.shape.length;\n\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length;
i++) {\n  newShape[i] = x.shape[perm[i]];\n }\n\n const values = backend.data.get(x.dataId).values as
TypedArray;\n const result = transposeImpl(values, x.shape, x.dtype, perm, newShape);\n\n const dataId =
backend.write(result, newShape, x.dtype);\n return {dataId, shape: newShape, dtype: x.dtype};\n}\n\nexport const
transposeConfig: KernelConfig = {\n  kernelName: Transpose,\n  backendName: 'cpu',\n  kernelFunc: transpose as
{ } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo,
TypedArray, upcastType, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from
'./backend_cpu';\nimport {assertNotComplex} from './cpu_util';\nimport {transpose} from './Transpose';\n\nexport
function prodImpl(\n  xShape: number[], xDtype: DataType, xVals: TypedArray,\n  reductionAxes: number[]):\n  {outVals: TypedArray, outShape: number[], outDtype: DataType} {\n  const [outShape, reduceShape] =\n  backend_util.computeOutAndReduceShapes(xShape, reductionAxes);\n  const outDtype = upcastType(xDtype,
'int32');\n  const outVals = util.makeZerosTypedArray(\n    util.sizeFromShape(outShape), outDtype) as
TypedArray;\n  const reduceSize = util.sizeFromShape(reduceShape);\n  for (let i = 0; i < outVals.length; ++i) {\n
  const offset = i * reduceSize;\n  let prod = 1;\n  for (let j = 0; j < reduceSize; ++j) {\n    prod *= xVals[offset +
j];\n  }\n  outVals[i] = prod;\n }\n\n return {outVals, outShape, outDtype};\n}\n\nexport function prod(\n  args:
{inputs: ProdInputs, backend: MathBackendCPU, attrs: ProdAttrs});\n  TensorInfo {\n  const {inputs, backend,
attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n\n  assertNotComplex(x, 'prod');\n\n  const
xRank = x.shape.length;\n  const axes = util.parseAxisParam(axis, x.shape);\n\n  const permutation =
backend_util.getAxesPermutation(axes, xRank);\n  let reductionAxes = axes;\n  let permutedX = x;\n  const
intermediateTensorInfos = [];\n  if (permutation != null) {\n    permutedX = transpose({inputs: {x}, backend, attrs:
{perm: permutation}});\n    intermediateTensorInfos.push(permutedX);\n    reductionAxes =
backend_util.getInnerMostAxes(reductionAxes.length, xRank);\n  }\n\n  const xVals =
backend.data.get(permutedX.dataId).values as TypedArray;\n  const {outVals, outShape, outDtype} =\n  prodImpl(permutedX.shape, permutedX.dtype, xVals, reductionAxes);\n\n  let resultShape = outShape;\n  if
(keepDims) {\n    resultShape = backend_util.expandShapeToKeepDim(outShape, axes);\n  }\n\n  intermediateTensorInfos.forEach(\n    t => backend.disposeIntermediateTensorInfo(t);\n  );\n\n  return
backend.makeTensorInfo(resultShape, outDtype, outVals);\n}\n\nexport const prodConfig: KernelConfig = {\n
kernelName: Prod,\n  backendName: 'cpu',\n  kernelFunc: prod as { } as KernelFunc\n};\n", "/*\n * @license\n *
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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {DataTypeMap, util} from '@tensorflow/tfjs-core';\n\nexport function rangeImpl(\n  start: number,
stop: number, step: number,\n  dtype: 'float32'|'int32'): DataTypeMap['float32'|'int32'] {\n  const sameStartStop =
start === stop;\n  const increasingRangeNegativeStep = start < stop && step < 0;\n  const
decreasingRangePositiveStep = stop < start && step > 1;\n\n  if (sameStartStop || increasingRangeNegativeStep ||\n

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    decreasingRangePositiveStep) {\n  return util.makeZerosTypedArray(0, dtype);\n }\n\n const numElements =
Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n\n if
(stop < start && step === 1) {\n  // Auto adjust the step's sign if it hasn't been set\n  // (or was set to 1)\n  step = -
1;\n }\n\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n  values[i] = values[i - 1] + step;\n }\n\n
return values;\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the
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on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from
'./utils/unary_impl';\n\nimport {unaryKernelFuncFromImpl} from './utils/unary_utils';\n\nexport const rsqrtImpl =
createSimpleUnaryImpl((xi) => 1 / Math.sqrt(xi));\n\nexport const rsqrt = unaryKernelFuncFromImpl(Rsqrt,
rsqrtImpl);\n\nexport const rsqrtConfig: KernelConfig = {\n  kernelName: Rsqrt,\n  backendName: 'cpu',\n  kernelFunc: rsqrt,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {backend_util, BackendValues, buffer, DataType, KernelConfig, KernelFunc, Slice, slice_util,
SliceAttrs, SliceInputs, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU}
from './backend_cpu';\n\nimport {assertNotComplex} from './cpu_util';\n\nexport function sliceImpl(\n  vals:
BackendValues, begin: number[], size: number[], shape: number[],\n  dtype: DataType): BackendValues {\n  const
isContinous = slice_util.isSliceContinous(shape, begin, size);\n  const length = util.sizeFromShape(size);\n  const
xStrides = util.computeStrides(shape);\n\n  if (isContinous) {\n    const flatOffset =
slice_util.computeFlatOffset(begin, xStrides);\n\n    if (dtype === 'string') {\n      return (vals as
Uint8Array[]).slice(flatOffset, flatOffset + length);\n    }\n\n    return (vals as TypedArray).subarray(flatOffset,
flatOffset + length);\n  }\n\n  const decodedData = dtype === 'string' ?\n  backend_util.fromUint8ToStringArray(vals as Uint8Array[]) :\n  vals as TypedArray;\n\n  const inBuf =
buffer(shape, dtype, decodedData);\n  const outBuf = buffer(size, dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n
const outLoc = outBuf.indexToLoc(i);\n  const inLoc = outLoc.map((idx: number, j) => idx + begin[j]);\n  outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n\n  if (dtype === 'string') {\n    return
backend_util.fromStringArrayToUint8(outBuf.values as string[]);\n  }\n  return outBuf.values as
TypedArray;\n}\n\nexport function slice(\n  args: {inputs: SliceInputs, backend: MathBackendCPU, attrs:
SliceAttrs});\n  TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {begin, size} =
attrs;\n\n  assertNotComplex(x, 'slice');\n  const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n
slice_util.assertParamsValid(x, $begin, $size);\n\n  const vals = backend.data.get(x.dataId).values;\n  const outVals
= sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n  return backend.makeTensorInfo($size, x.dtype,
outVals);\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'cpu',\n  kernelFunc: slice as { } as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
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=====\n*\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport\n{createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from\n'../utils/binary_utils';\n\nexport const squaredDifferenceImpl = createSimpleBinaryKernelImpl(((a, b) => {\n  const\n  diff = a - b;\n  return diff * diff;\n}));\n\nexport const squaredDifference =\n  binaryKernelFunc(SquaredDifference,\n  squaredDifferenceImpl);\n\nexport const squaredDifferenceConfig: KernelConfig = {\n  kernelName:\n  SquaredDifference,\n  backendName: 'cpu',\n  kernelFunc: squaredDifference\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
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=====\n*\n\nimport {buffer, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\nexport function stridedSliceImpl<R\n  extends Rank>(\n  outShape: number[], xBuf: TensorBuffer<R>, strides: number[],\n  begin: number[]):\n  TensorBuffer<R> {\n  const outBuf = buffer(outShape, xBuf.dtype);\n  for (let i = 0; i < outBuf.size; i++) {\n  const loc = outBuf.indexToLoc(i);\n  const newLoc: number[] = new Array(loc.length);\n  for (let j = 0; j <\n  newLoc.length; j++) {\n  newLoc[j] = loc[j] * strides[j] + begin[j];\n  }\n  outBuf.set(xBuf.get(...newLoc),\n  ...loc);\n  }\n  return outBuf as TensorBuffer<R>;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
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=====\n*\n\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl} from\n'../utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from\n'../utils/binary_utils';\n\nexport const subImpl =\n  createSimpleBinaryKernelImpl(((aValue, bValue) => aValue -\n  bValue));\n\nexport const subComplexImpl =\n  createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) =>\n  {\n  return {real: aReal - bReal, imag: aImag - bImag};\n  }));\n\nexport const sub = binaryKernelFunc(Sub,\n  subImpl, subComplexImpl);\n\nexport const subConfig: KernelConfig = {\n  kernelName:\n  Sub,\n  backendName:\n  'cpu',\n  kernelFunc: sub\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

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=====\n*\n\nimport {buffer, DataType, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\n/**\n * An implementation\n * of the tile kernel shared between WebGL and CPU for string\n * tensors only.\n */\n\nexport function tileImpl<R\n  extends Rank>(\n  xBuf: TensorBuffer<R, DataType>,\n  reps: number[]): TensorBuffer<R, DataType> {\n  const\n  newShape: number[] = new Array(xBuf.rank);\n  for (let i = 0; i < newShape.length; i++) {\n  newShape[i] =\n\n
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xBuf.shape[i] * reps[i];\n }\n const result = buffer(newShape, xBuf.dtype);\n for (let i = 0; i < result.values.length;\n ++i) {\n const newLoc = result.indexToLoc(i);\n const originalLoc: number[] = new Array(xBuf.rank);\n for\n (let j = 0; j < originalLoc.length; j++) {\n originalLoc[j] = newLoc[j] % xBuf.shape[j];\n }\n const\n originalIndex = xBuf.locToIndex(originalLoc);\n result.values[i] = xBuf.values[originalIndex];\n }\n return\n result as TensorBuffer<R, DataType>;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

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=====\n\n*\n\n** An implementation of the TopK kernel shared between webgl and cpu. *\n\nimport {buffer,\n NumericDataType, Rank, ShapeMap, Tensor, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-\ncore';\n\nexport function topKImpl<T extends Tensor, R extends Rank>(\n x: TypedArray, xShape: number[],\n xDtype: NumericDataType, k: number,\n sorted: boolean):\n [TensorBuffer<R, NumericDataType>,\n TensorBuffer<R, 'int32'>] {\n // Reshape into a 2d tensor [batch, lastDim] and compute topk along lastDim.\n const\n lastDim = xShape[xShape.length - 1];\n const [batch, size] = [x.length / lastDim, lastDim];\n const allTopKVals =\n util.getTypedArrayFromDType(xDtype, batch * k);\n const allTopKIndices =\n util.getTypedArrayFromDType('int32', batch * k);\n for (let b = 0; b < batch; b++) {\n const offset = b * size;\n const vals = x.subarray(offset, offset + size);\n const valAndInd: Array<{value: number, index: number}> = [];\n for (let i = 0; i < vals.length; i++) {\n valAndInd.push({value: vals[i], index: i});\n }\n valAndInd.sort((a, b)\n => b.value - a.value);\n const outOffset = b * k;\n const topKVals = allTopKVals.subarray(outOffset,\n outOffset + k);\n const topKIndices = allTopKIndices.subarray(outOffset, outOffset + k);\n for (let i = 0; i < k;\n i++) {\n topKVals[i] = valAndInd[i].value;\n topKIndices[i] = valAndInd[i].index;\n }\n }\n // Reshape\n back to the original input shape, except that the last\n // dimension is k.\n const outputShape = xShape.slice();\n outputShape[outputShape.length - 1] = k;\n return [\n buffer(outputShape as ShapeMap[R], xDtype,\n allTopKVals),\n buffer(outputShape as ShapeMap[R], 'int32', allTopKIndices)\n ];\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n agreed to in writing, software\n * distributed under the License is distributed on an\n * \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport {BackendValues, DataType, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport\n function uniqueImpl(\n values: BackendValues, axis: number, shape: number[], dtype: DataType): {\n\n outputValues: BackendValues,\n outputShape: number[],\n indices: BackendValues\n } {\n // Normalize and\n validate axis.\n const $axis = util.parseAxisParam(axis, shape)[0];\n // Calculate the new shape that is suitable for\n extracting data along the\n // given axis.\n //\n // The rank is 3.\n // The size of the 1st dimension is the size of all\n the axes < the given axis.\n // The size of the 2nd dimension is the same as the size of the given axis.\n // The size\n of the 3rd dimension is the size of all the axes > the given axis.\n //\n // For example, for a 4D tensor with\n shape=[2, 3, 5, 4] and axis=2, the\n // newShape would be: [2*3, 5, 4].\n //\n // Note that this is not the final output\n shape. This will be the shape for an\n // intermediate TensorBuffer (see inputBuffer below) to allow us to extract\n // values along the given axis. To demonstrate how it works, consider the\n // following example:\n //\n // Input: a\n 3D tensor, with shape [1, 2, 3]\n // [\n // [\n // [1,2,3],\n // [4,5,6]\n // ]\n // ]\n // Axis: 2 (the last axis).\n //\n // Along axis 2, we expect to extract 3 tensors: [1,4], [2,5], [3,6].\n //\n // For this example, newShape would be: [2,\n 3, 1], where 2 is calculated from\n // 1*2. The re-shaped data would look like:\n //\n // [\n // [1], [2],
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[3]\n // ],\n // [\n // [4], [5], [6]\n // ]\n // \n // \n // Then, we can construct a 3-level nested loop by the
following dimension\n // order to extract the values along the axis (dimension1):\n // i: dimension1 // 0,1,2
(newShape[1])\n // m: dimension0 // 0,1 (newShape[0])\n // n: dimension2 // 0 (newShape[2])\n // \n //
m, i, n\n // ----- \n // Iteration 0: data at [0, 0, 0] => \"1\"\n // Iteration 1: data at [1, 0, 0]
=> \"4\"\n // We got [1,4].\n // Iteration 2: data at [0, 1, 0] => \"2\"\n // Iteration 3: data at [1, 1, 0] => \"5\"\n // We
got [2,5].\n // Iteration 4: data at [0, 2, 0] => \"3\"\n // Iteration 5: data at [1, 2, 0] => \"6\"\n // We got [3,6].\n
const newShape = [1, shape[0], 1];\n for (let i = 0; i < $axis; i++) {\n newShape[0] *= shape[i];\n }\n
newShape[1] = shape[$axis];\n for (let i = $axis + 1; i < shape.length; i++) {\n newShape[2] *= shape[i];\n }\n\n
// A map from unique elements (their string representations) to their values\n // in \"indices\" (below).\n const
uniqueElements: {[key: string]: number} = {};\n // The indices of each unique element in the original tensor along
the given\n // axis. It is 1D and has the same size as the given axis.\n const indices = new
Int32Array(shape[$axis]);\n // Create a buffer so we can easily extract value at a given location.\n const
inputBuffer = new TensorBuffer(newShape, dtype, values as TypedArray);\n // The indices along the given axis
that have unique elements. This is a\n // de-duped version of \"indices\" above.\n const uniqueIndices: number[] =
[];\n const is1DTensor = newShape[0] === 1 && newShape[2] === 1;\n for (let i = 0; i < shape[$axis]; i++) {\n
// Extract values along the axis.\n let element: string;\n if (is1DTensor) {\n // Fast path for 1D tensor input.\n
element = values[i].toString();\n } else {\n const axisValues = [];\n for (let m = 0; m < newShape[0]; m++)
{\n for (let n = 0; n < newShape[2]; n++) {\n axisValues.push(inputBuffer.get(m, i, n));\n }\n }\n
element = axisValues.join(',');\n }\n // Dedup and update various indices.\n if (uniqueElements[element] !==
undefined) {\n indices[i] = uniqueElements[element];\n } else {\n const uniqueIndex =
Object.keys(uniqueElements).length;\n uniqueElements[element] = uniqueIndex;\n indices[i] =
uniqueIndex;\n uniqueIndices.push(i);\n }\n }\n\n // Now we know where each of the unique elements are
located along the axis\n // (uniqueIndices). Extract them from input buffer and store them in the\n // output
buffer.\n const outputTmpShape = newShape.slice();\n outputTmpShape[1] =
Object.keys(uniqueElements).length;\n const outputBuffer = new TensorBuffer(outputTmpShape, dtype);\n
uniqueIndices.forEach((uniqueElementIndex, i) => {\n for (let m = 0; m < newShape[0]; m++) {\n for (let n =
0; n < newShape[2]; n++) {\n outputBuffer.set(inputBuffer.get(m, uniqueElementIndex, n), m, i, n);\n }\n
}\n });\n\n // The output shape can be calculated from the input shape with the size of\n // the given axis replaced
by the number of unique elements along that axis.\n const outputShape = shape.slice();\n outputShape[$axis] =
outputTmpShape[1];\n return {\n outputValues: outputBuffer.values as BackendValues,\n outputShape,\n
indices,\n };}\n\n\",/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\n// Shared functionality among backends.\nexport {simpleAbsImpl} from './kernels/Abs';\nexport {addImpl}
from './kernels/Add';\nexport {bincountImpl, bincountReduceImpl} from './kernels/Bincount_impl';\nexport
{ceilImpl} from './kernels/Ceil';\nexport {concatImpl} from './kernels/Concat_impl';\nexport {expImpl} from
 './kernels/Exp';\nexport {expm1Impl} from './kernels/Expm1';\nexport {floorImpl} from './kernels/Floor';\nexport
{gatherV2Impl} from './kernels/GatherV2_impl';\nexport {greaterImpl} from './kernels/Greater';\nexport {lessImpl}
from './kernels/Less';\nexport {linSpaceImpl} from './kernels/LinSpace_impl';\nexport {logImpl} from
 './kernels/Log';\nexport {maxImpl} from './kernels/Max_impl';\nexport {maximumImpl} from
 './kernels/Maximum';\nexport {minimumImpl} from './kernels/Minimum';\nexport {multiplyImpl} from
 './kernels/Multiply';\nexport {negImpl} from './kernels/Neg';\nexport {notEqualImpl} from
 './kernels/NotEqual';\nexport {prodImpl} from './kernels/Prod';\nexport {rangeImpl} from

```

```

./kernels/Range_impl';\nextport {rsqrtImpl} from './kernels/Rsqrt';\nextport {sliceImpl} from
./kernels/Slice';\nextport {squaredDifferenceImpl} from './kernels/SquaredDifference';\nextport {stridedSliceImpl}
from './kernels/StridedSlice_impl';\nextport {subImpl} from './kernels/Sub';\nextport {tileImpl} from
./kernels/Tile_impl';\nextport {topKImpl} from './kernels/TopK_impl';\nextport {transposeImpl} from
./kernels/Transpose_impl';\nextport {uniqueImpl} from './kernels/Unique_impl';\nextport
{ComplexBinaryKernelImpl, SimpleBinaryKernelImpl} from './utils/binary_types';\n", "\n/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-
line: no-imports-from-dist\nimport * as shared from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-
next-line: no-imports-from-dist\nimport {SimpleBinaryKernelImpl} from '@tensorflow/tfjs-backend-
cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {SimpleUnaryImpl} from
'@tensorflow/tfjs-backend-cpu/dist/utils/unary_types';\n\nexport type SimpleBinaryKernelImplCPU =
SimpleBinaryKernelImpl;\nextport type SimpleUnaryKernelImplCPU = SimpleUnaryImpl;\nconst {\n addImpl:
addImplCPU,\n bincountImpl: bincountImplCPU,\n bincountReduceImpl: bincountReduceImplCPU,\n ceilImpl:
ceilImplCPU,\n concatImpl: concatImplCPU,\n expImpl: expImplCPU,\n expm1Impl: expm1ImplCPU,\n
floorImpl: floorImplCPU,\n gatherV2Impl: gatherV2ImplCPU,\n greaterImpl: greaterImplCPU,\n lessImpl:
lessImplCPU,\n linSpaceImpl: linSpaceImplCPU,\n logImpl: logImplCPU,\n maxImpl: maxImplCPU,\n
maximumImpl: maximumImplCPU,\n minimumImpl: minimumImplCPU,\n multiplyImpl: multiplyImplCPU,\n
negImpl: negImplCPU,\n prodImpl: prodImplCPU,\n rangeImpl: rangeImplCPU,\n rsqrtImpl: rsqrtImplCPU,\n
simpleAbsImpl: simpleAbsImplCPU,\n sliceImpl: sliceImplCPU,\n stridedSliceImpl: stridedSliceImplCPU,\n
subImpl: subImplCPU,\n tileImpl: tileImplCPU,\n topKImpl: topKImplCPU,\n transposeImpl:
transposeImplCPU,\n uniqueImpl: uniqueImplCPU,\n } = shared;\n\nexport {\n addImplCPU,\n
bincountImplCPU,\n bincountReduceImplCPU,\n ceilImplCPU,\n concatImplCPU,\n expImplCPU,\n
expm1ImplCPU,\n floorImplCPU,\n gatherV2ImplCPU,\n greaterImplCPU,\n lessImplCPU,\n
linSpaceImplCPU,\n logImplCPU,\n maxImplCPU,\n maximumImplCPU,\n minimumImplCPU,\n
multiplyImplCPU,\n negImplCPU,\n prodImplCPU,\n simpleAbsImplCPU,\n sliceImplCPU,\n
stridedSliceImplCPU,\n subImplCPU,\n rangeImplCPU,\n rsqrtImplCPU,\n tileImplCPU,\n topKImplCPU,\n
transposeImplCPU,\n uniqueImplCPU,\n};\n", "\n/*\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nexport function getVecChannels(name: string, rank: number): string[] {\n return ['x', 'y', 'z', 'w', 'u', 'v'].slice(0,
rank).map(d => `${name}.${d}`);\n}\n\nexport function getChannels(name: string, rank: number): string[] {\n if
(rank === 1) {\n return [name];\n }\n return getVecChannels(name, rank);\n}\n\nexport function
getSourceCoords(rank: number, dims: string[]): string {\n if (rank === 1) {\n return 'rc';\n }\n\n let coords = "";\n
for (let i = 0; i < rank; i++) {\n coords += dims[i];\n if (i < rank - 1) {\n coords += ',';\n }\n }\n return
coords;\n}", "\n/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

```

License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class PackProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = false;\n  packedOutput = true;\n\n  constructor(\n    outputShape: number[]\n  ) {\n    //\n    // TODO(https://github.com/tensorflow/tfjs/issues/893):\n    // Only input / output 3D tensors.\n    this.outputShape = outputShape;\n    const rank = outputShape.length;\n\n    if (rank === 0) {\n      this.userCode =\n        `void main() {\n          setOutput(vec4(getA(), 0., 0., 0.));\n        }`;\n    } else {\n      const channels = getChannels('rc', rank);\n      const dtype = getCoordsDataType(rank);\n      const outOfBoundsCondition =\n        getOutOfBoundsCondition(rank, outputShape, channels);\n      const setup = getSetup(\n        rank,\n        outputShape[outputShape.length - 1],\n        outputShape[outputShape.length - 2], channels);\n      const output =\n        getOutput(outputShape, channels);\n      this.userCode = `void main() {\n        ${dtype} rc =\n        getOutputCoords();\n        if(${outOfBoundsCondition}) {\n          setOutput(vec4(0));\n        } else {\n        ${setup}\n          setOutput(vec4(${output}));\n        }\n      }`;\n    }\n\n    function\n    getSourceCoordsArr(rank: number, dims: string[]): string[] {\n      const coords = [];\n      for (let row = 0; row <= 1;\n        row++) {\n        for (let col = 0; col <= 1; col++) {\n          let coord = `${row === 0 ? 'r' : 'rp1'}`,\n            ${col === 0 ? 'c' : 'cp1'}`;\n          for (let d = 2; d < rank; d++) {\n            coord = `${dims[dims.length - 1 - d]},` + coord;\n          }\n          coords.push(coord);\n        }\n      }\n      return coords;\n    }\n\n    function getOutOfBoundsCondition(\n      rank: number, shape:\n      number[], dims: string[]): string {\n      if (rank === 1) {\n        return `rc > ${shape[0]}`;\n      }\n      let cond = \"\";\n      for (let i = rank - 2; i < rank; i++) {\n        cond += `${dims[i]} >= ${shape[i]}`;\n        if (i < rank - 1) {\n          cond += \"||\";\n        }\n      }\n      return cond;\n    }\n\n    function getSetup(\n      rank: number, cols: number, rows: number, dims: string[]): string {\n      if (rank === 1) {\n        return \"\";\n      }\n      const innerDims = dims.slice(-2);\n      return `\n      int r =\n      ${innerDims[0]};\n      int c = ${innerDims[1]};\n      int rp1 = r + 1;\n      int cp1 = c + 1;\n      bool cEdge = cp1 >=\n      ${cols};\n      bool rEdge = rp1 >= ${rows};\n      `;\n    }\n\n    function getOutput(shape: number[], dims: string[]): string {\n      const rank = shape.length;\n      const sourceCoords = getSourceCoordsArr(rank, dims);\n      if (rank === 1) {\n        return `getA(rc),\n          rc + 1 >= ${shape[0]} ? 0. : getA(rc + 1),\n          0, 0`;\n      }\n      return\n        `getA(${sourceCoords[0]}),\n          cEdge ? 0. : getA(${sourceCoords[1]}),\n          rEdge ? 0. :\n          getA(${sourceCoords[2]}),\n          rEdge || cEdge ? 0. : getA(${sourceCoords[3]})`;\n    }\n\n    \"**\n    * @license\n    * Copyright 2018 Google LLC. All Rights Reserved.\n    * Licensed under the Apache License, Version 2.0 (the\n    * \"License\");\n    * you may not use this file except in compliance with the License.\n    * You may obtain a copy of the\n    * License at\n    * http://www.apache.org/licenses/LICENSE-2.0\n    * Unless required by applicable law or\n    * agreed to in writing, software\n    * distributed under the License is distributed on an \"AS IS\" BASIS,\n    * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n    * See the License for the\n    * specific language governing permissions and\n    * limitations under the License.\n    *\n    `;\n  }\n}
```

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from\n  './shader_compiler_util';\n\nexport class ReshapePackedProgram implements GPGPUProgram {\n  variableNames =\n  ['A'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(outputShape: [number, number, number], inputShape: [\n    number, number, number\n  ]) {\n    this.outputShape = outputShape;\n\n    let mainLoop = ``;\n    for (let i = 0; i < 4; i++) {\n      let thisRC = `thisRC =\n      rc`;\n      if (i % 2 === 1) {\n        thisRC += `thisRC.z += 1`;\n      }\n      if (i > 1) {\n        thisRC += `thisRC.y +=\n        1`;\n      }\n      mainLoop += `\n      ${thisRC}\n      ${i > 0 ? `if(thisRC.y < rows && thisRC.z < cols)` : ``}`;\n      int flatIndex = getFlatIndex(thisRC);\n      ivec3 inputRC =\n    }\n  }\n}
```

```

inputCoordsFromReshapedOutCoords(flatIndex);\n      vec2 inputRCInnerDims =
vec2(float(inputRC.y),float(inputRC.z));\n\n      result[${i}] =\n      getChannel(getA(inputRC.x, inputRC.y,
inputRC.z), inputRCInnerDims);\n      ${i > 0 ? '}' : ''};\n      }\n\n      this.userCode = `\n
${getReshapedInputCoords(inputShape)}\n      ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n      void
main() {\n      ivec3 rc = getOutputCoords();\n\n      vec4 result = vec4(0.);\n\n      ivec3 thisRC;\n      int rows =
${outputShape[1]};\n      int cols = ${outputShape[2]};\n\n      ${mainLoop}\n\n      setOutput(result);\n      }\n
`;\n      }\n\n\nfunction getReshapedInputCoords(shape: [number, number, number]): string {\n      const
coordsFromIndexSnippet =\n      shader_util.getLogLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n\n      return `\n
      ivec3 inputCoordsFromReshapedOutCoords(int index) {\n      ${coordsFromIndexSnippet}\n      return ivec3(r, c,
d);\n      }\n      `;\n      }\n      "/**\n      * @license\n      * Copyright 2017 Google LLC. All Rights Reserved.\n      * Licensed under the
Apache License, Version 2.0 (the "License");\n      * you may not use this file except in compliance with the
License.\n      * You may obtain a copy of the License at\n      * http://www.apache.org/licenses/LICENSE-2.0\n      *
Unless required by applicable law or agreed to in writing, software\n      * distributed under the License is distributed
on an "AS IS" BASIS,\n      * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n      * See the License for the specific language governing permissions and\n      * limitations under the
License.\n      *
=====
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nimport {GPGPUContext} from './gpgpu_context';\n\nimport
{getInternalFormatForFloat16MatrixTexture, getInternalFormatForFloat16PackedMatrixTexture,
getInternalFormatForFloat32MatrixTexture, getInternalFormatForPackedMatrixTexture,
getInternalFormatForUnsignedBytesMatrixTexture} from './gpgpu_util';\n\nimport
{getPackedMatrixTextureShapeWidthHeight, getUnpackedMatrixTextureShapeWidthHeight, PhysicalTextureType,
TextureConfig, TextureUsage} from './tex_util';\n\nexport class TextureManager {\n      private numUsedTextures =
0;\n      private numFreeTextures = 0;\n      private _numBytesAllocated = 0;\n      private _numBytesFree = 0; // How many
bytes that have been allocated\n\n      // are available for reuse.\n      private freeTextures: {[shape: string]:
WebGLTexture[]} = {};\n      private logEnabled = false;\n      private usedTextures: {[shape: string]: WebGLTexture[]}
= {};\n\n      constructor(private gpgpu: GPGPUContext) {\n\n      acquireTexture(\n      shapeRC: [number, number],
usage: TextureUsage,\n      isPacked: boolean): WebGLTexture {\n      const physicalTexType =
getPhysicalFromLogicalTextureType(usage, isPacked);\n\n      const shapeKey =
getKeyFromTextureShape(shapeRC, physicalTexType, isPacked);\n      if (!(shapeKey in this.freeTextures)) {\n
this.freeTextures[shapeKey] = [];\n      }\n      if (!(shapeKey in this.usedTextures)) {\n
this.usedTextures[shapeKey] = [];\n      }\n\n      const texBytes = computeBytes(\n      shapeRC, physicalTexType,
this.gpgpu.gl, this.gpgpu.textureConfig,\n      isPacked);\n\n      if (this.freeTextures[shapeKey].length > 0) {\n
this.numFreeTextures--;\n      this.numUsedTextures++;\n      this._numBytesFree -= texBytes;\n      this.log();\n      const newTexture = this.freeTextures[shapeKey].shift();\n      this.usedTextures[shapeKey].push(newTexture);\n      return newTexture;\n      }\n\n      let newTexture: WebGLTexture;\n      if (physicalTexType ===
PhysicalTextureType.PACKED_2X2_FLOAT32) {\n      newTexture =
this.gpgpu.createPackedMatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType ===
PhysicalTextureType.PACKED_2X2_FLOAT16) {\n      newTexture =\n
this.gpgpu.createFloat16PackedMatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType ===
PhysicalTextureType.UNPACKED_FLOAT32) {\n      newTexture =\n
this.gpgpu.createFloat32MatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (physicalTexType ===
PhysicalTextureType.UNPACKED_FLOAT16) {\n      newTexture =\n
this.gpgpu.createFloat16MatrixTexture(shapeRC[0], shapeRC[1]);\n      } else if (\n      physicalTexType ===
PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE) {\n      newTexture =\n
this.gpgpu.createUnsignedBytesMatrixTexture(shapeRC[0], shapeRC[1]);\n      }\n\n      this.usedTextures[shapeKey].push(newTexture);\n\n      this.numUsedTextures++;\n      this._numBytesAllocated +=
texBytes;\n      this.log();\n\n      return newTexture;\n      }\n\n      releaseTexture(\n      texture: WebGLTexture, shape:

```

```

[number, number],\n    logicalTexType: TextureUsage, isPacked: boolean): void {\n    if (this.freeTextures == null)\n    {\n    // Already disposed.\n    return;\n    }\n    const physicalTexType =\n    getPhysicalFromLogicalTextureType(logicalTexType, isPacked);\n    const shapeKey =\n    getKeyFromTextureShape(shape, physicalTexType, isPacked);\n    if (!(shapeKey in this.freeTextures)) {\n    this.freeTextures[shapeKey] = [];\n    }\n    const texBytes = computeBytes(\n    shape, physicalTexType,\n    this.gpgpu.gl, this.gpgpu.textureConfig,\n    isPacked);\n    const deleteTexThreshold =\n    env().get('WEBGL_DELETE_TEXTURE_THRESHOLD');\n    if (deleteTexThreshold !== -1 &&\n    this._numBytesAllocated > deleteTexThreshold) {\n    this.gpgpu.deleteMatrixTexture(texture);\n    this._numBytesAllocated -= texBytes;\n    } else {\n    this.freeTextures[shapeKey].push(texture);\n    this.numFreeTextures++;\n    this._numBytesFree += texBytes;\n    }\n    this.numUsedTextures--;\n    const\n    texList = this.usedTextures[shapeKey];\n    const texIndex = texList.indexOf(texture);\n    if (texIndex < 0) {\n    throw new Error(\n    'Cannot release a texture that was never provided by this '\n    +\n    'texture manager');\n    }\n    texList.splice(texIndex, 1);\n    this.log();\n    }\n    private log() {\n    if (!this.logEnabled) {\n    return;\n    }\n    const total = this.numFreeTextures + this.numUsedTextures;\n    console.log(\n    'Free/Used',\n    `${this.numFreeTextures} / ${this.numUsedTextures}`, \n    `(${total})`);\n    const freeRatio =\n    this._numBytesFree / this._numBytesAllocated;\n    console.log(`Bytes allocated: ${this._numBytesAllocated}`);\n    console.log(`Bytes unused: ${this._numBytesFree} (${Math.round(100 * freeRatio)}%)`);\n    }\n    get\n    numBytesAllocated(): number {\n    return this._numBytesAllocated;\n    }\n    get numBytesFree(): number {\n    return this._numBytesFree;\n    }\n    getNumUsedTextures(): number {\n    return this.numUsedTextures;\n    }\n    getNumFreeTextures(): number {\n    return this.numFreeTextures;\n    }\n    dispose() {\n    if (this.freeTextures ==\n    null) {\n    // Already disposed.\n    return;\n    }\n    for (const texShape in this.freeTextures) {\n    this.freeTextures[texShape].forEach(tex => {\n    this.gpgpu.deleteMatrixTexture(tex);\n    });\n    }\n    for\n    (const texShape in this.usedTextures) {\n    this.usedTextures[texShape].forEach(tex => {\n    this.gpgpu.deleteMatrixTexture(tex);\n    });\n    }\n    this.freeTextures = null;\n    this.usedTextures = null;\n    this.numUsedTextures = 0;\n    this.numFreeTextures = 0;\n    this._numBytesAllocated = 0;\n    this._numBytesFree = 0;\n    }\n    }\n    function numBytesForInternalFormat(\n    gl: WebGLRenderingContext,\n    internalFormat: number): number {\n    // tslint:disable-next-line:no-any\n    const glany = gl as any;\n    if\n    (internalFormat === glany.R32F) {\n    return 4;\n    } else if (internalFormat === glany.R16F) {\n    return 2;\n    }\n    else if (internalFormat === glany.RGBA32F) {\n    return 16;\n    } else if (internalFormat === gl.RGBA) {\n    return 16;\n    } else if (internalFormat === glany.RGBA16F) {\n    return 8;\n    }\n    throw new Error(`Unknown\n    internal format ${internalFormat}`);\n    }\n    export function computeBytes(\n    shape: [number, number],\n    physicalTexType: PhysicalTextureType,\n    gl: WebGLRenderingContext, textureConfig: TextureConfig,\n    isPacked: boolean): number {\n    // It is not possible to infer packed status from the texture type because\n    //\n    // depending on the textureConfig, different texture types may resolve to the\n    //\n    // same internal format (e.g. in\n    //\n    // WebGL1, the internal format for\n    //\n    // UNPACKED_FLOAT16 textures is gl.RGBA). Therefore we pass in\n    //\n    // `isPacked`\n    //\n    // explicitly.\n    const internalFormat =\n    internalFormatForPhysicalTexType(physicalTexType,\n    textureConfig);\n    let numElements: number;\n    if (isPacked) {\n    const [packedWidth, packedHeight] =\n    getPackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = packedWidth *\n    packedHeight;\n    }\n    else {\n    const [width, height] =\n    getUnpackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = width * height;\n    }\n    const bytesPerElement = numBytesForInternalFormat(gl, internalFormat);\n    return numElements *\n    bytesPerElement;\n    }\n    function internalFormatForPhysicalTexType(\n    physicalTexType:\n    PhysicalTextureType,\n    textureConfig: TextureConfig): number {\n    switch (physicalTexType) {\n    case\n    PhysicalTextureType.PACKED_2X2_FLOAT32:\n    return\n    getInternalFormatForPackedMatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.PACKED_2X2_FLOAT16:\n    return\n    getInternalFormatForFloat16PackedMatrixTexture(textureConfig);\n    case\n    PhysicalTextureType.UNPACKED_FLOAT32:\n    return

```



```

result.b;\n result.a = isNaN.a ? x.a : result.a;\n\n return result;\n`;\n\nexport const RELU6 = `\n  vec4 result =
min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0)));;\n  bvec4 isNaN = isNaN(x);\n\n result.r = isNaN.r ? x.r :
result.r;\n result.g = isNaN.g ? x.g : result.g;\n result.b = isNaN.b ? x.b : result.b;\n result.a = isNaN.a ? x.a :
result.a;\n\n return result;\n`;\n\nexport class UnaryOpPackedProgram implements GPGPUProgram {\n
variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = true;\n packedOutput =
true;\n\n constructor(aShape: number[], opSnippet: string) {\n  this.outputShape = aShape;\n  this.userCode = `\n
  vec4 unaryOperation(vec4 x) {\n    ${opSnippet}\n  }\n\n  void main() {\n    vec4 x =
getAAtOutCoords();\n    vec4 y = unaryOperation(x);\n\n    setOutput(y);\n  }\n  `;\n }\n}\n",`/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels, getSourceCoords} from
'./packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class UnpackProgram
implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n  packedOutput = false;\n
outputShape: number[];\n  userCode: string;\n\n  constructor(outputShape: number[]) {\n    this.outputShape =
outputShape;\n    const rank = outputShape.length;\n\n    const channels = getChannels('rc', rank);\n    const dtype =
getCoordsDataType(rank);\n    const sourceCoords = getSourceCoords(rank, channels);\n    const innerDims =
channels.slice(-2);\n    const coords = rank <= 1 ? 'rc' : `vec2(${innerDims.join(',')}`);\n\n    this.userCode = `\n
void main() {\n  ${dtype} rc = getOutputCoords();\n  vec4 packedInput = getA(${sourceCoords});\n\n
setOutput(getChannel(packedInput, ${coords}));\n  }\n  `;\n }\n}\n",`/**\n * @license\n * Copyright 2017
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\n// Import WebGL flags.\nimport './flags_webgl';\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport
{backend_util, BackendValues, buffer, DataId, DataStorage, DataType, DataValues, engine, env, kernel_impls,
KernelBackend, MemoryInfo, NumericDataType, Rank, RecursiveArray, scalar, ShapeMap, Tensor, Tensor2D,
TensorBuffer, TensorInfo, tidy, TimingInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport
{getWebGLContext} from './canvas_util';\nimport {DecodeMatrixProgram} from './decode_matrix_gpu';\nimport
{DecodeMatrixPackedProgram} from './decode_matrix_packed_gpu';\nimport {EncodeFloatProgram} from
'./encode_float_gpu';\nimport {EncodeFloatPackedProgram} from './encode_float_packed_gpu';\nimport
{EncodeMatrixProgram} from './encode_matrix_gpu';\nimport {EncodeMatrixPackedProgram} from
'./encode_matrix_packed_gpu';\nimport {GPGPUContext} from './gpgpu_context';\nimport * as gpgpu_math from
'./gpgpu_math';\nimport {GPGPUBinary, GPGPUProgram, TensorData} from './gpgpu_math';\nimport
{simpleAbsImplCPU} from './kernel_utils/shared';\nimport {PackProgram} from './pack_gpu';\nimport
{ReshapePackedProgram} from './reshape_packed_gpu';\nimport * as tex_util from './tex_util';\nimport
{TextureData, TextureUsage} from './tex_util';\nimport {TextureManager} from './texture_manager';\nimport * as
unary_op from './unaryop_gpu';\nimport {UnaryOpProgram} from './unaryop_gpu';\nimport
{UnaryOpPackedProgram} from './unaryop_packed_gpu';\nimport {UnpackProgram} from './unpack_gpu';\nimport
* as webgl_util from './webgl_util';\n\nconst whereImpl = kernel_impls.whereImpl;\n\nexport const
EPSILON_FLOAT32 = 1e-7;\nexport const EPSILON_FLOAT16 = 1e-4;\n\nntype KernelInfo = {\n  name: string;

```

```

query: Promise<number>;\n};\n\nexport type TimerNode = RecursiveArray<KernelInfo>|KernelInfo;\nexport
interface CPUTimerQuery {\n startMs: number;\n endMs?: number;\n}\n\nexport interface WebGLMemoryInfo
extends MemoryInfo {\n numBytesInGPU: number;\n // Tracks the total number of bytes allocated on the GPU,
accounting for the\n // physical texture type.\n numBytesInGPUAllocated: number;\n // Tracks byte size of
textures that were created and then made available for\n // reuse (disposed).\n numBytesInGPUFree: number;\n
unreliable: boolean;\n}\n\nexport interface WebGLTimingInfo extends TimingInfo {\n uploadWaitMs: number;\n
downloadWaitMs: number;\n}\n\nconst binaryCaches: {[webGLVersion: string]: {[key: string]: GPGPUBinary}} =
{\n};\n\nexport function getBinaryCache(webGLVersion: number) {\n if (webGLVersion in binaryCaches) {\n
return binaryCaches[webGLVersion];\n } \n binaryCaches[webGLVersion] = {};\n return
binaryCaches[webGLVersion];\n}\n\n// Empirically determined constant used to determine size threshold for
handling\n// off execution to the CPU.\nconst CPU_HANDOFF_SIZE_THRESHOLD = 128;\n\n// Empirically
determined constant used to decide the number of MB on GPU\n// before we warn about high memory use. The MB
are this constant * screen area\n// * dpi / 1024 / 1024.\nconst BEFORE_PAGING_CONSTANT = 600;\nfunction
numMBBeforeWarning(): number {\n if (env().global.screen == null) {\n return 1024; // 1 GB.\n } \n return
(env().global.screen.height * env().global.screen.width * \n window.devicePixelRatio) * \n
BEFORE_PAGING_CONSTANT / 1024 / 1024;\n}\n\nexport class MathBackendWebGL extends KernelBackend
{\n texData: DataStorage<TextureData>;\n gpgpu: GPGPUContext;\n\n private static nextDataId = 0;\n private
nextDataId(): number {\n return MathBackendWebGL.nextDataId++;\n } \n // Maps data ids that have a pending
read operation, to list of subscribers.\n private pendingRead = new WeakMap<DataId, Array<(arr: TypedArray) =>
void>>());\n // List of data ids that are scheduled for disposal, but are waiting on a\n // pending read operation.\n
private pendingDisposal = new WeakSet<DataId>();\n\n // Used to count the number of 'shallow' sliced tensors that
point to the\n // same data id.\n dataRefCount = new WeakMap<DataId, number>();\n private numBytesInGPU =
0;\n\n private canvas: HTMLCanvasElement|OffscreenCanvas;\n\n private programTimersStack: TimerNode[];\n
private activeTimers: TimerNode[];\n // Accumulated time spent (including blocking) in uploading data to webgl.\n
private uploadWaitMs = 0;\n // Accumulated time spent (including blocking in downloading data from webgl.\n
private downloadWaitMs = 0;\n private cpuBackend: KernelBackend;\n\n // Number of bits of precision of this
backend.\n private floatPrecisionValue: 32|16;\n\n private textureManager: TextureManager;\n private
binaryCache: {[key: string]: GPGPUBinary};\n private gpgpuCreatedLocally: boolean;\n private
numMBBeforeWarning: number;\n private warnedAboutMemory = false;\n private warnedAboutCPUBackend =
false;\n\n constructor(gpgpu?: GPGPUContext) {\n super();\n if (!env().getBool('HAS_WEBGL')) {\n throw
new Error('WebGL is not supported on this device');\n } \n\n if (gpgpu == null) {\n const gl =
getWebGLContext(env().getNumber('WEBGL_VERSION'));\n this.binaryCache =
getBinaryCache(env().getNumber('WEBGL_VERSION'));\n this.gpgpu = new GPGPUContext(gl);\n
this.canvas = gl.canvas;\n this.gpgpuCreatedLocally = true;\n } else {\n this.gpgpu = gpgpu;\n
this.binaryCache = {};\n this.gpgpuCreatedLocally = false;\n this.canvas = gpgpu.gl.canvas;\n } \n\n
this.textureManager = new TextureManager(this.gpgpu);\n this.numMBBeforeWarning =
numMBBeforeWarning();\n\n this.texData = new DataStorage(this, engine());\n } \n\n numDataIds() {\n return
this.texData.numDataIds() + \n (this.cpuBackend ? this.cpuBackend.numDataIds() : 0) - \n
this.pendingDeletes;\n } \n\n write(values: BackendValues, shape: number[], dtype: DataType): DataId {\n if
(env().getBool('WEBGL_CHECK_NUMERICAL_PROBLEMS') || \n env().getBool('DEBUG')) {\n
this.checkNumericalProblems(values);\n } \n\n if (dtype === 'complex64' && values != null) {\n throw new
Error(\n `Cannot write to a complex64 dtype. ` + \n `Please use tf.complex(real, imag).`);\n } \n\n const
dataId = {id: this.nextDataId()};\n this.texData.set(\n dataId, \n {shape, dtype, values, usage:
TextureUsage.UPLOAD, refCount: 1});\n return dataId;\n } \n\n /** Return refCount of a `TensorData`. */ \n
refCount(dataId: DataId): number {\n if (this.texData.has(dataId)) {\n const tensorData =
this.texData.get(dataId);\n return tensorData.refCount;\n } \n\n return 0;\n } \n\n /** Increase refCount of a
`TextureData`. */ \n incRef(dataId: DataId): void {\n const texData = this.texData.get(dataId);\n
texData.refCount++;\n } \n\n /** Decrease refCount of a `TextureData`. */ \n decRef(dataId: DataId): void {\n if

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(this.texData.has(dataId)) {\n    const texData = this.texData.get(dataId);\n    texData.refCount--;\n  }\n }\n\nmove(\n  dataId: DataId, values: BackendValues, shape: number[], dtype: DataType,\n  refCount: number):\nvoid {\n  if (env().getBool('DEBUG')) {\n    this.checkNumericalProblems(values);\n  }\n  if (dtype ===\n  'complex64') {\n    throw new Error(\n      `Cannot write to a complex64 dtype. ` +\n      `Please use\n  tf.complex(real, imag).`);\n  }\n  this.texData.set(\n    dataId, {shape, dtype, values, usage:\n  TextureUsage.UPLOAD, refCount});\n }\n\ndisposeIntermediateTensorInfo(tensorInfo: TensorInfo): void {\n  this.disposeData(tensorInfo.dataId);\n }\n\nreadSync(dataId: DataId): BackendValues {\n  const texData =\n  this.texData.get(dataId);\n  const {values, dtype, complexTensorInfos, slice, shape, isPacked} = texData;\n\n  //\n  The presence of `slice` indicates this tensor is a shallow slice of a\n  // different tensor, and is using that original\n  tensor's texture. Run\n  // `clone` in order to copy that texture and read from it.\n  if (slice != null) {\n    let\n  program;\n    if (isPacked) {\n      program = new UnaryOpPackedProgram(shape, unary_op.CLONE);\n    } else\n  {\n      program = new UnaryOpProgram(shape, unary_op.CLONE);\n    }\n    const res =\n  this.runWebGLProgram(program, [{dataId, shape, dtype}], dtype);\n    const data = this.readSync(res.dataId);\n  this.disposeIntermediateTensorInfo(res);\n  return data;\n }\n  if (values != null) {\n    return\n  this.convertAndCacheOnCPU(dataId);\n  }\n  if (dtype === 'string') {\n    return values;\n  }\n  const\n  shouldTimeProgram = this.activeTimers != null;\n  let start: number;\n  if (shouldTimeProgram) {\n    start =\n  util.now();\n  }\n\n  let result: Float32Array;\n  if (dtype === 'complex64') {\n    const realValues =\n  this.readSync(complexTensorInfos.real.dataId) as Float32Array;\n    const imagValues =\n  this.readSync(complexTensorInfos.imag.dataId) as Float32Array;\n    result =\n  backend_util.mergeRealAndImagArrays(realValues, imagValues);\n  } else {\n    result =\n  this.getValuesFromTexture(dataId);\n  }\n\n  if (shouldTimeProgram) {\n    this.downloadWaitMs += util.now()\n  - start;\n  }\n  return this.convertAndCacheOnCPU(dataId, result);\n }\n\nasync read(dataId: DataId):\nPromise<BackendValues> {\n  if (this.pendingRead.has(dataId)) {\n    const subscribers =\n  this.pendingRead.get(dataId);\n    return new Promise<TypedArray>(resolve => subscribers.push(resolve));\n  }\n\n  const texData = this.texData.get(dataId);\n  const {values, shape, slice, dtype, complexTensorInfos, isPacked} =\n  texData;\n\n  // The presence of `slice` indicates this tensor is a shallow slice of a\n  // different tensor, and is\n  using that original tensor's texture. Run\n  // `clone` in order to copy that texture and read from it.\n  if (slice !=\n  null) {\n    let program;\n    if (isPacked) {\n      program = new UnaryOpPackedProgram(shape,\n  unary_op.CLONE);\n    } else {\n      program = new UnaryOpProgram(shape, unary_op.CLONE);\n    }\n    const res =\n  this.runWebGLProgram(program, [{dataId, shape, dtype}], dtype);\n    const data =\n  this.read(res.dataId);\n    this.disposeIntermediateTensorInfo(res);\n    return data;\n  }\n\n  if (values != null)\n  {\n    return this.convertAndCacheOnCPU(dataId);\n  }\n\n  if\n  (!env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED') &&\n  env().getNumber('WEBGL_VERSION') === 2) {\n    throw new Error(\n      `tensor.data() with\n  WEBGL_DOWNLOAD_FLOAT_ENABLED=false and ` +\n      `WEBGL_VERSION=2 not yet supported.`);\n  }\n\n  let buffer = null;\n  let tmpDownloadTarget: TensorInfo;\n\n  if (dtype !== 'complex64' &&\n  env().get('WEBGL_BUFFER_SUPPORTED')) {\n    // Possibly copy the texture into a buffer before inserting a\n  fence.\n    tmpDownloadTarget = this.decode(dataId);\n    const tmpData =\n  this.texData.get(tmpDownloadTarget.dataId);\n    buffer = this.gpgpu.createBufferFromTexture(\n  tmpData.texture, ...tex_util.getDenseTexShape(shape));\n  }\n\n  this.pendingRead.set(dataId, []);\n\n  if (dtype\n  !== 'complex64') {\n    // Create a fence and wait for it to resolve.\n    await\n  this.gpgpu.createAndWaitForFence();\n  }\n\n  // Download the values from the GPU.\n  let vals:\n  Float32Array;\n  if (dtype === 'complex64') {\n    const ps = await Promise.all([\n  this.read(complexTensorInfos.real.dataId),\n  this.read(complexTensorInfos.imag.dataId)\n  ]);\n    const\n  realValues = ps[0];\n    const imagValues = ps[1];\n    vals = backend_util.mergeRealAndImagArrays(\n  realValues as Float32Array, imagValues as Float32Array);\n  } else if (buffer == null) {\n    vals =\n  this.getValuesFromTexture(dataId);\n  } else {\n    const size = util.sizeFromShape(shape);\n    vals =\n  this.gpgpu.downloadFloat32MatrixFromBuffer(buffer, size);\n  }\n\n  if (tmpDownloadTarget != null) {\n
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this.disposeIntermediateTensorInfo(tmpDownloadTarget);\n } \n const dtypeVals =
this.convertAndCacheOnCPU(dataId, vals);\n \n const subscribers = this.pendingRead.get(dataId);\n
this.pendingRead.delete(dataId);\n \n // Notify all pending reads.\n subscribers.forEach(resolve =>
resolve(dtypeVals));\n if (this.pendingDisposal.has(dataId)) {\n this.pendingDisposal.delete(dataId);\n if
(this.disposeData(dataId)) {\n engine().removeDataId(dataId, this);\n } \n this.pendingDeletes--;\n } \n
return dtypeVals;\n } \n \n bufferSync<R extends Rank>(t: TensorInfo): TensorBuffer<R> {\n const data =
this.readSync(t.dataId);\n let decodedData = data as DataValues;\n if (t.dtype === 'string') {\n try {\n //
Decode the bytes into string.\n decodedData = (data as Uint8Array[]).map(d => util.decodeString(d));\n }
catch {\n throw new Error('Failed to decode encoded string bytes into utf-8');\n } \n } \n return
buffer(t.shape as ShapeMap[R], t.dtype, decodedData) as\n TensorBuffer<R>;\n } \n \n private
checkNumericalProblems(values: BackendValues): void {\n if (values == null) {\n return;\n } \n for (let i =
0; i < values.length; i++) {\n const num = values[i] as number;\n if (!webgl_util.canBeRepresented(num)) {\n
if (env().getBool('WEBGL_RENDER_FLOAT32_CAPABLE')) {\n throw Error(\n `The value
${num} cannot be represented with your ` +\n `current settings. Consider enabling float32 rendering: ` +\n
`tf.env().set('WEBGL_RENDER_FLOAT32_ENABLED', true);`);\n } \n throw Error(`The value
${num} cannot be represented on this device.`);\n } \n } \n } \n \n private getValuesFromTexture(dataId:
DataId): Float32Array {\n const {shape, dtype, isPacked} = this.texData.get(dataId);\n const size =
util.sizeFromShape(shape);\n if (env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED')) {\n const
tmpTarget = this.decode(dataId);\n const tmpData = this.texData.get(tmpTarget.dataId);\n const vals =
this.gpgpu\n .downloadMatrixFromPackedTexture(\n tmpData.texture,
...tex_util.getDenseTexShape(shape))\n .subarray(0, size);\n \n this.disposeIntermediateTensorInfo(tmpTarget);\n \n return vals;\n } \n \n const shouldUsePackedProgram =\n env().getBool('WEBGL_PACK') && isPacked === true;\n const outputShape =\n shouldUsePackedProgram ? webgl_util.getShapeAs3D(shape) : shape;\n const program =
shouldUsePackedProgram ?\n new EncodeFloatPackedProgram(outputShape as [number, number, number]) :\n new EncodeFloatProgram(outputShape);\n const output = this.runWebGLProgram(\n program, [{shape:
outputShape, dtype, dataId}], 'float32');\n const tmpData = this.texData.get(output.dataId);\n const vals =\n this.gpgpu\n .downloadByteEncodedFloatMatrixFromOutputTexture(\n tmpData.texture,
tmpData.texShape[0], tmpData.texShape[1])\n .subarray(0, size);\n \n this.disposeIntermediateTensorInfo(output);\n \n return vals;\n } \n \n timerAvailable(): boolean {\n return
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0;\n } \n \n async time(f:
() => void): Promise<WebGLTimingInfo> {\n const oldActiveTimers = this.activeTimers;\n const
newActiveTimers: TimerNode[] = [];\n \n let outerMostTime = false;\n if (this.programTimersStack == null) {\n
this.programTimersStack = newActiveTimers;\n outerMostTime = true;\n } else {\n
this.activeTimers.push(newActiveTimers);\n } \n \n this.activeTimers = newActiveTimers;\n \n f();\n \n //
needing to split these up because util.flatten only accepts certain types\n const flattenedActiveTimerQueries =\n util.flatten(this.activeTimers.map((d: KernelInfo) => d.query))\n .filter(d => d != null);\n const
flattenedActiveTimerNames =\n util.flatten(this.activeTimers.map((d: KernelInfo) => d.name))\n .filter(d
=> d != null);\n \n this.activeTimers = oldActiveTimers;\n \n if (outerMostTime) {\n this.programTimersStack
= null;\n } \n \n const res: WebGLTimingInfo = {\n uploadWaitMs: this.uploadWaitMs,\n
downloadWaitMs: this.downloadWaitMs,\n kernelMs: null,\n wallMs: null // will be filled by the engine\n
};\n \n if (env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n
const kernelMs = await Promise.all(flattenedActiveTimerQueries);\n \n res['kernelMs'] = util.sum(kernelMs);\n
res['getExtraProfileInfo'] = () =>\n kernelMs.map((d, i) => ({name: flattenedActiveTimerNames[i], ms: d}))\n
.map(d => `${d.name}: ${d.ms}`)\n .join(', ');\n } else {\n res['kernelMs'] = {\n error:
'WebGL query timers are not supported in this environment.\n };\n } \n \n this.uploadWaitMs = 0;\n
this.downloadWaitMs = 0;\n return res;\n } \n \n memory(): WebGLMemoryInfo {\n return {\n unreliable:
false,\n numBytesInGPU: this.numBytesInGPU,\n numBytesInGPUAllocated:

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this.textureManager.numBytesAllocated,\n    numBytesInGPUFree: this.textureManager.numBytesFree\n  } as
WebGLMemoryInfo;\n }\n\n private startTimer(): WebGLQuery|CPUTimerQuery {\n  if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n    return
this.gpgpu.beginQuery();\n  }\n  return {startMs: util.now(), endMs: null};\n }\n\n private endTimer(query:
WebGLQuery|CPUTimerQuery): WebGLQuery|CPUTimerQuery {\n  if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n
this.gpgpu.endQuery();\n    return query;\n  }\n  (query as CPUTimerQuery).endMs = util.now();\n  return
query;\n }\n\n private async getQueryTime(query: WebGLQuery|CPUTimerQuery): Promise<number> {\n  if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n    return
this.gpgpu.waitForQueryAndGetTime(query as WebGLQuery);\n  }\n  const timerQuery = query as
CPUTimerQuery;\n  return timerQuery.endMs - timerQuery.startMs;\n }\n\n private pendingDeletes = 0;\n\n
/**\n * Decrease the RefCount on the dataId and dispose the memory if the dataId\n * has 0 refCount. If there are
pending read on the data, the disposal would\n * added to the pending delete queue. Return true if the dataId is
removed\n * from backend or the backend does not contain the dataId, false if the\n * dataId is not removed.
Memory may or may not be released even when dataId\n * is removed, which also depends on dataRefCount, see
`releaseGPU`.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n
disposeData(dataId: DataId, force = false): boolean {\n  if (this.pendingDisposal.has(dataId)) {\n    return
false;\n  }\n\n // No-op if already disposed.\n  if (!this.texData.has(dataId)) {\n    return true;\n  }\n\n // if
force flag is set, change refCount to 0, this would ensure disposal\n // when added to the pendingDisposal queue.
Memory may or may not be\n // released, which also depends on dataRefCount, see `releaseGPU`.\n  if (force) {\n
this.texData.get(dataId).refCount = 0;\n  } else {\n    this.texData.get(dataId).refCount--;\n  }\n\n if (!force &&
this.texData.get(dataId).refCount > 0) {\n    return false;\n  }\n\n if (this.pendingRead.has(dataId)) {\n
this.pendingDisposal.add(dataId);\n    this.pendingDeletes++;\n    return false;\n  }\n\n
this.releaseGPUData(dataId);\n  const {complexTensorInfos} = this.texData.get(dataId);\n  if
(complexTensorInfos != null) {\n    this.disposeData(complexTensorInfos.real.dataId, force);\n
this.disposeData(complexTensorInfos.imag.dataId, force);\n  }\n\n this.texData.delete(dataId);\n\n return
true;\n }\n\n private releaseGPUData(dataId: DataId): void {\n  const {texture, dtype, texShape, usage, isPacked,
slice} =\n    this.texData.get(dataId);\n  const key = slice && slice.origDataId || dataId;\n  const refCount =
this.dataRefCount.get(key);\n  if (refCount > 1) {\n    this.dataRefCount.set(key, refCount - 1);\n  } else {\n
this.dataRefCount.delete(key);\n    if (texture != null) {\n      this.numBytesInGPU -=
this.computeBytes(texShape, dtype);\n      this.textureManager.releaseTexture(texture, texShape, usage,
isPacked);\n    }\n  }\n\n const texData = this.texData.get(dataId);\n  texData.texture = null;\n
texData.texShape = null;\n  texData.isPacked = false;\n  texData.slice = null;\n }\n\n getTexture(dataId: DataId):
WebGLTexture {\n  this.uploadToGPU(dataId);\n  return this.texData.get(dataId).texture;\n }\n\n /**\n *
Returns internal information for the specific data bucket. Used in unit\n * tests.\n */\n getDataInfo(dataId:
DataId): TextureData {\n  return this.texData.get(dataId);\n }\n\n private getCPUBackend(): KernelBackend|null
{\n  if (!env().getBool('WEBGL_CPU_FORWARD')) {\n    return null;\n  }\n\n if (this.cpuBackend == null) {\n
this.cpuBackend = engine().findBackend('cpu');\n  }\n\n return this.cpuBackend;\n }\n\n /*\n Tests
whether all the inputs to an op are small and on the CPU. This heuristic\n determines when it would be faster to
execute a kernel on the CPU. WebGL\n kernels opt into running this check and forwarding when appropriate.\n
TODO(https://github.com/tensorflow/tfjs/issues/872): Develop a more\n sustainable strategy for optimizing
backend execution of ops.\n */\n shouldExecuteOnCPU(\n  inputs: TensorInfo[],\n  sizeThreshold =
CPU_HANDOFF_SIZE_THRESHOLD): boolean {\n  const cpuBackend = this.getCPUBackend();\n  if
(!env().getBool('IS_TEST') && !this.warnedAboutCPUBackend &&\n    cpuBackend == null) {\n
console.warn(\n    'Your application contains ops that are small enough to be ' +\n    'executed on the CPU
backend, however the CPU backend cannot ' +\n    'be found. Consider importing the CPU backend ' +\n
'(@tensorflow/tfjs-backend-cpu) for better performance.);\n  }\n\n this.warnedAboutCPUBackend = true;\n }\n\n
return cpuBackend != null &&\n    inputs.every(\n      input => this.texData.get(input.dataId).texture == null

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&&\n        util.sizeFromShape(input.shape) < sizeThreshold);\n    }\n\n    getGPGPUContext(): GPGPUContext\n    {\n        return this.gpgpu;\n    }\n\n    where(condition: Tensor): Tensor2D {\n        backend_util.warn(\n            'tf.where() in\n            webgl locks the UI thread. ' +\n            'Call tf.whereAsync() instead');\n        const condVals = condition.dataSync();\n        return whereImpl(condition.shape, condVals);\n    }\n\n    private packedUnaryOp(x: TensorInfo, op: string, dtype:\n    DataType) {\n        const program = new UnaryOpPackedProgram(x.shape, op);\n        const outInfo =\n        this.compileAndRun(program, [x], dtype);\n        return engine().makeTensorFromDataId(\n            outInfo.dataId,\n            outInfo.shape, outInfo.dtype);\n    }\n\n    // TODO(msoulanille) remove this once the backend has been modularized\n    // a copy is needed here to break a circular dependency.\n    // Also remove the op from unary_op.\n    abs<T extends\n    Tensor>(x: T): T {\n        // TODO: handle cases when x is complex.\n        if (this.shouldExecuteOnCPU([x]) &&\n        x.dtype !== 'complex64') {\n            const outValues =\n                simpleAbsImplCPU(this.texData.get(x.dataId).values as\n                TypedArray);\n            return this.makeOutput(x.shape, x.dtype, outValues);\n        }\n        if\n        (env().getBool('WEBGL_PACK_UNARY_OPERATIONS')) {\n            return this.packedUnaryOp(x, unary_op.ABS,\n            x.dtype) as T;\n        }\n        const program = new UnaryOpProgram(x.shape, unary_op.ABS);\n        const outInfo =\n        this.compileAndRun(program, [x]);\n        return engine().makeTensorFromDataId(\n            outInfo.dataId,\n            outInfo.shape, outInfo.dtype) as T;\n    }\n\n    makeTensorInfo(\n        shape: number[], dtype: DataType,\n        values?:\n        BackendValues|string[]): TensorInfo {\n        let dataId;\n        if (dtype === 'string' && values != null && values.length\n        > 0 &&\n        util.isString(values[0])) {\n            const encodedValues =\n                (values as {}) as string[]).map(d =>\n                util.encodeString(d));\n            dataId = this.write(encodedValues, shape, dtype);\n        } else {\n            dataId =\n            this.write(values as TypedArray, shape, dtype);\n        }\n        this.texData.get(dataId).usage = null;\n        return {dataId,\n        shape, dtype};\n    }\n\n    private makeOutput<T extends Tensor>(\n        shape: number[], dtype: DataType, values?:\n        BackendValues): T {\n        const {dataId} = this.makeTensorInfo(shape, dtype, values);\n        return\n        engine().makeTensorFromDataId(dataId, shape, dtype, this) as T;\n    }\n\n    private unpackTensor(input: TensorInfo):\n    TensorInfo {\n        const program = new UnpackProgram(input.shape);\n        return this.runWebGLProgram(program,\n        [input], input.dtype);\n    }\n\n    private packTensor(input: TensorInfo): TensorInfo {\n        const program = new\n        PackProgram(input.shape);\n        const preventEagerUnpackingOutput = true;\n        return this.runWebGLProgram(\n        program, [input], input.dtype, null /* customSetup */,\n        preventEagerUnpackingOutput);\n    }\n\n    private\n    packedReshape(input: TensorInfo, afterShape: number[]): TensorInfo {\n        const input3DShape = [\n        webgl_util.getBatchDim(input.shape),\n        ...webgl_util.getRowsCols(input.shape)\n        ] as [number, number,\n        number];\n        const input3D: TensorInfo = {\n            dtype: input.dtype,\n            shape: input3DShape,\n            dataId:\n            input.dataId\n        };\n        const afterShapeAs3D = [\n        webgl_util.getBatchDim(afterShape),\n        ...webgl_util.getRowsCols(afterShape)\n        ] as [number, number, number];\n        const program = new\n        ReshapePackedProgram(afterShapeAs3D, input3DShape);\n        const preventEagerUnpackingOfOutput = true;\n        const output = this.runWebGLProgram(\n        program, [input3D], input.dtype, null /* customSetup */,\n        preventEagerUnpackingOfOutput);\n        return {dataId: output.dataId, shape: afterShape, dtype: output.dtype};\n    }\n\n    private decode(dataId: DataId): TensorInfo {\n        const texData = this.texData.get(dataId);\n        const\n        {isPacked, shape, dtype} = texData;\n        const shapeAs3D =\n        webgl_util.getShapeAs3D(shape) as [number,\n        number, number];\n        let program;\n        if (isPacked) {\n            program = new\n            DecodeMatrixPackedProgram(shapeAs3D);\n        } else {\n            program = new DecodeMatrixProgram(shapeAs3D);\n        }\n        const preventEagerUnpackingOfOutput = true;\n        const out = this.runWebGLProgram(\n        program,\n        [{shape: shapeAs3D, dtype, dataId}], dtype,\n        null /* customSetup */, preventEagerUnpackingOfOutput);\n        return {dtype, shape, dataId: out.dataId};\n    }\n\n    runWebGLProgram(\n        program: GPGPUProgram, inputs:\n        TensorInfo[], outputDType: DataType,\n        customSetup?: (gpgpu: GPGPUContext, webGLProgram:\n        WebGLProgram) => void,\n        preventEagerUnpackingOfOutput = false): TensorInfo {\n        const output =\n        this.makeTensorInfo(program.outputShape, outputDType);\n        const outData = this.texData.get(output.dataId);\n        if\n        (program.packedOutput) {\n            outData.isPacked = true;\n        }\n        if (program.outPackingScheme ===\n        tex_util.PackingScheme.DENSE) {\n            const texelShape = tex_util.getDenseTexShape(program.outputShape);\n            // For a densely packed output, we explicitly set texShape\n            // so it doesn't get assigned later according to our\n            typical packing\n            // scheme wherein a single texel can only contain values from adjacent\n            // rows/cols.\n
```

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outData.texShape = texelShape.map(d => d * 2) as [number, number];\n  }\n  if (program.outTexUsage != null)
{\n    outData.usage = program.outTexUsage;\n  }\n  if (util.sizeFromShape(output.shape) === 0) {\n    //
Short-circuit the computation since the result is empty (has 0 in its\n    // shape).\n    outData.values = \n
util.getTypedArrayFromDType(output.dtype as 'float32', 0);\n    return output;\n  }\n\n  const dataToDispose:
TensorInfo[] = [];\n  const inputsData: TensorData[] = inputs.map(input => {\n    if (input.dtype === 'complex64')
{\n      throw new Error(\n        `GPGPUProgram does not support complex64 input. For complex64` +\n
`dtypes, please separate the program into real and imaginary` +\n        `parts.`);\n    }\n\n    let texData =
this.texData.get(input.dataId);\n    if (texData.texture == null) {\n      if (!program.packedInputs &&\n
util.sizeFromShape(input.shape) <=\n        env().getNumber('WEBGL_SIZE_UPLOAD_UNIFORM')) {\n
// Upload small tensors that live on the CPU as uniforms, not as\n        // textures. Do this only when the
environment supports 32bit floats\n        // due to problems when comparing 16bit floats with 32bit floats.\n        //
TODO(https://github.com/tensorflow/tfjs/issues/821): Make it\n        // possible for packed shaders to sample from
uniforms.\n        return {\n          shape: input.shape,\n          texData: null,\n          isUniform: true,\n
uniformValues: texData.values as TypedArray\n        };\n      }\n\n      // This ensures that if a packed program's
inputs have not yet been\n      // uploaded to the GPU, they get uploaded as packed right off the bat.\n      if
(program.packedInputs) {\n        texData.isPacked = true;\n        texData.shape = input.shape;\n      }\n    } else
if (!texData.isPacked !== !program.packedInputs) {\n      input = texData.isPacked ? this.unpackTensor(input) :\n
this.packTensor(input);\n      dataToDispose.push(input);\n      texData =
this.texData.get(input.dataId);\n    } else if (\n      texData.isPacked &&\n
!webgl_util.isReshapeFree(texData.shape, input.shape)) {\n      // This is a special case where a texture exists for a
tensor\n      // but the shapes are incompatible (due to packing constraints) because\n      // the tensor did not have
a chance to go through the packed reshape\n      // shader. This only happens when we reshape the *same* tensor to
form\n      // *distinct* inputs to an op, e.g. dotting a vector with itself. This\n      // case will disappear once
packed uploading is the default.\n\n      const savedInput = input;\n      const targetShape = input.shape;\n\n      input.shape = texData.shape;\n      input = this.packedReshape(input as Tensor, targetShape);\n
dataToDispose.push(input);\n      texData = this.texData.get(input.dataId);\n\n      savedInput.shape =
targetShape;\n    }\n\n    this.uploadToGPU(input.dataId);\n    return {shape: input.shape, texData, isUniform:
false};\n  });\n\n  this.uploadToGPU(output.dataId);\n  const outputData:\n    TensorData = {shape:
output.shape, texData: outData, isUniform: false};\n  const key = gpgpu_math.makeShaderKey(program,
inputsData, outputData);\n  const binary = this.getAndSaveBinary(key, () => {\n    return
gpgpu_math.compileProgram(\n      this.gpgpu, program, inputsData, outputData);\n  });\n  const
shouldTimeProgram = this.activeTimers != null;\n  let query: WebGLQuery|CPUTimerQuery;\n  if
(shouldTimeProgram) {\n    query = this.startTimer();\n  }\n\n  gpgpu_math.runProgram(\n    this.gpgpu,
binary, inputsData, outputData, customSetup);\n\n  dataToDispose.forEach(info =>
this.disposeIntermediateTensorInfo(info));\n\n  if (shouldTimeProgram) {\n    query = this.endTimer(query);\n
this.activeTimers.push(\n      {name: program.constructor.name, query: this.getQueryTime(query)});\n  }\n\n  if
(!env().getBool('WEBGL_LAZILY_UNPACK') && outData.isPacked &&\n    preventEagerUnpackingOfOutput
=== false) {\n    const unpacked = this.unpackTensor(output);\n    this.disposeIntermediateTensorInfo(output);\n
return unpacked;\n  }\n  return output;\n}\n\n compileAndRun(\n  program: GPGPUProgram, inputs:
TensorInfo[], outputDtype?: DataType,\n  customSetup?: (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) => void,\n  preventEagerUnpackingOfOutput = false): TensorInfo {\n  outputDtype =
outputDtype || inputs[0].dtype;\n  const outInfo = this.runWebGLProgram(\n    program, inputs, outputDtype,
customSetup,\n    preventEagerUnpackingOfOutput);\n  return outInfo;\n}\n\n private getAndSaveBinary(key:
string, getBinary: () => GPGPUBinary):\n  GPGPUBinary {\n  if (!(key in this.binaryCache)) {\n
this.binaryCache[key] = getBinary();\n  }\n  return this.binaryCache[key];\n}\n\n private getTextureManager():
TextureManager {\n  return this.textureManager;\n}\n\n private disposed = false;\n\n dispose() {\n  if
(this.disposed) {\n    return;\n  }\n  // Avoid disposing the compiled webgl programs during unit testing
because\n  // it slows down test execution.\n  if (!env().getBool('IS_TEST')) {\n    const allKeys =

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Object.keys(this.binaryCache);\n    allKeys.forEach(key => {\n
this.gpgpu.deleteProgram(this.binaryCache[key].webGLProgram);\n    delete this.binaryCache[key];\n    });\n
}\n this.textureManager.dispose();\n if (this.canvas != null &&\n (typeof (HTMLCanvasElement) !==
'undefined' &&\n this.canvas instanceof HTMLCanvasElement)) {\n this.canvas.remove();\n } else {\n
this.canvas = null;\n }\n if (this.gpgpuCreatedLocally) {\n this.gpgpu.program = null;\n
this.gpgpu.dispose();\n }\n this.disposed = true;\n }\n\n floatPrecision(): 16|32 {\n if (this.floatPrecisionValue
== null) {\n this.floatPrecisionValue = tidy() => {\n if
(!env().get('WEBGL_RENDER_FLOAT32_ENABLED')) {\n // Momentarily switching DEBUG flag to false
so we don't throw an\n // error trying to upload a small value.\n const debugFlag =
env().getBool('DEBUG');\n env().set('DEBUG', false);\n const underflowCheckValue =
this.abs(scalar(1e-8)).dataSync()[0];\n env().set('DEBUG', debugFlag);\n\n if (underflowCheckValue >
0) {\n return 32;\n }\n }\n return 16;\n });\n }\n return this.floatPrecisionValue;\n }\n\n
/** Returns the smallest representable number. */\n epsilon(): number {\n return this.floatPrecision() === 32 ?
EPSILON_FLOAT32 : EPSILON_FLOAT16;\n }\n\n uploadToGPU(dataId: DataId): void {\n const texData =
this.texData.get(dataId);\n const {shape, dtype, values, texture, usage, isPacked} = texData;\n\n if (texture !=
null) {\n // Array is already on GPU. No-op.\n return;\n }\n const shouldTimeProgram = this.activeTimers
!= null;\n let start: number;\n if (shouldTimeProgram) {\n start = util.now();\n }\n\n let texShape =
texData.texShape;\n if (texShape == null) {\n texShape =
webgl_util.getTextureShapeFromLogicalShape(shape, isPacked);\n texData.texShape = texShape;\n }\n\n if
(values != null) {\n const shapeAs3D = webgl_util.getShapeAs3D(shape);\n\n let program;\n let width =
texShape[1], height = texShape[0];\n const isArray = values instanceof Uint8Array;\n\n if (isPacked) {\n
[width, height] = tex_util.getPackedMatrixTextureShapeWidthHeight(\n texShape[0], texShape[1]);\n
program = new EncodeMatrixPackedProgram(\n shapeAs3D, [height, width], isArray);\n } else {\n
program =\n new EncodeMatrixProgram(shapeAs3D, [height, width], isArray);\n }\n\n const
tempDenseInputHandle = this.makeTensorInfo([height, width], dtype);\n if (isArray) {\n
this.texData.get(tempDenseInputHandle.dataId).usage =\n TextureUsage.PIXELS;\n } else {\n
this.texData.get(tempDenseInputHandle.dataId).usage =\n TextureUsage.UPLOAD;\n }\n\n
this.gpgpu.uploadDenseMatrixToTexture(\n this.getTexture(tempDenseInputHandle.dataId), width, height,\n
values as TypedArray);\n\n // We want the output to remain packed regardless of the value of\n //
WEBGL_PACK.\n const preventEagerUnpacking = true;\n const encodedOutputTarget =
this.runWebGLProgram(\n program, [tempDenseInputHandle], dtype, null, preventEagerUnpacking);\n\n //
Have the original texture assume the identity of the encoded output.\n const outputTexData =
this.texData.get(encodedOutputTarget.dataId);\n texData.texture = outputTexData.texture;\n texData.texShape
= outputTexData.texShape;\n texData.isPacked = outputTexData.isPacked;\n texData.usage =
outputTexData.usage;\n\n this.disposeIntermediateTensorInfo(tempDenseInputHandle);\n
this.texData.delete(encodedOutputTarget.dataId);\n\n // Once uploaded, don't store the values on cpu.\n
texData.values = null;\n if (shouldTimeProgram) {\n this.uploadWaitMs += util.now() - start;\n }\n }
else {\n const newTexture = this.acquireTexture(texShape, usage, dtype, isPacked);\n texData.texture =
newTexture;\n }\n }\n\n private convertAndCacheOnCPU(dataId: DataId, float32Values?: Float32Array):\n
TypedArray {\n const texData = this.texData.get(dataId);\n const {dtype} = texData;\n\n
this.releaseGPUData(dataId);\n\n if (float32Values != null) {\n texData.values =
float32ToTypedArray(float32Values, dtype as 'float32');\n }\n return texData.values as TypedArray;\n }\n\n
private acquireTexture(\n texShape: [number, number], texType: TextureUsage, dtype: DataType,\n isPacked:
boolean): WebGLTexture {\n this.numBytesInGPU += this.computeBytes(texShape, dtype);\n if
(!this.warnedAboutMemory &&\n this.numBytesInGPU > this.numMBBeforeWarning * 1024 * 1024) {\n
const mb = (this.numBytesInGPU / 1024 / 1024).toFixed(2);\n this.warnedAboutMemory = true;\n
console.warn(\n `High memory usage in GPU: ${mb} MB, ` +\n `most likely due to a memory leak`);\n
}\n return this.textureManager.acquireTexture(texShape, texType, isPacked);\n }\n\n private

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computeBytes(shape: [number, number], dtype: DataType) {\n  return shape[0] * shape[1] *
util.bytesPerElement(dtype);\n }\n}\n\nfunction float32ToTypedArray<D extends NumericDataType>(\n a:
Float32Array, dtype: D): tf.DataTypeMap[D] {\n  if (dtype === 'float32' || dtype === 'complex64') {\n  return a as
tf.DataTypeMap[D];\n } else if (dtype === 'int32' || dtype === 'bool') {\n  const result = (dtype === 'int32') ? new
Int32Array(a.length) :\n
new Uint8Array(a.length);\n  for (let i = 0; i < result.length; ++i)
{\n  result[i] = Math.round(a[i]);\n }\n } return result as tf.DataTypeMap[D];\n } else {\n  throw new
Error(`Unknown dtype ${dtype}`);\n }\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {env} from '@tensorflow/tfjs-core';\n\nimport * as gpgpu_util from './gpgpu_util';\n\nimport * as
webgl_util from './webgl_util';\n\nexport {MathBackendWebGL, WebGLMemoryInfo, WebGLTimingInfo} from
'./backend_webgl';\n\nexport {setWebGLContext} from './canvas_util';\n\nexport {GPGPUContext} from
'./gpgpu_context';\n\nexport {GPGPUProgram} from './gpgpu_math';\n\n// WebGL specific utils.\n\nexport {gpgpu_util,
webgl_util};\n\n/**\n * Enforce use of half precision textures if available on the platform.\n *\n * @doc {heading:
'Environment', namespace: 'webgl'}\n *\n\nexport function forceHalfFloat(): void {\n
env().set('WEBGL_FORCE_F16_TEXTURES', true);\n }\n\n"/**\n * @license\n * Copyright 2017 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport const CHECK_NAN_SNIPPET =`\n  if (isnan(a)) return a;\n  if (isnan(b)) return
b;\n`;\n\nexport const SQUARED_DIFFERENCE = `return (a - b) * (a - b);`\n\nexport class BinaryOpProgram
implements GPGPUProgram {\n  variableNames = ['A', 'B'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(op: string, aShape: number[], bShape: number[]) {\n    this.outputShape =
backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    this.userCode =`\n    float binaryOperation(float
a, float b) {\n    ${op}\n    }\n\n    void main() {\n    float a = getAAtOutCoords();\n    float b =
getBAtOutCoords();\n    setOutput(binaryOperation(a, b));\n    }\n  `;\n }\n}\n\n"/**\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nimport {getChannels} from './packing_util';\n\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport const CHECK_NAN_SNIPPET =`\n  result.r = isNaN.N.r > 0. ? NAN : result.r;\n
result.g = isNaN.N.g > 0. ? NAN : result.g;\n  result.b = isNaN.N.b > 0. ? NAN : result.b;\n  result.a =
isNaN.N.a > 0. ?
NAN : result.a;\n`;\n\nexport const ELU_DER =`\n  vec4 bGTEZero = vec4(greaterThanEqual(b, vec4(0.)));\n

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return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0))));\n`;\n\nexport const NOT_EQUAL = `\n
return vec4(notEqual(a, b));\n`;\n\nexport class BinaryOpPackedProgram implements GPGPUProgram {\n
variableNames = ['A', 'B'];\n outputShape: number[];\n userCode: string;\n supportsBroadcasting = true;\n
packedInputs = true;\n packedOutput = true;\n\n constructor(\n   op: string, aShape: number[], bShape:
number[],\n   checkOutOfBounds = false) {\n   this.outputShape =
backend_util.assertAndGetBroadcastShape(aShape, bShape);\n   const rank = this.outputShape.length;\n   let
checkOutOfBoundsString = ";\n   if (checkOutOfBounds) {\n     if (rank === 0 ||
util.sizeFromShape(this.outputShape) === 1) {\n       checkOutOfBoundsString = `\n       result.y = 0.;\n
result.z = 0.;\n       result.w = 0.;\n       `;\n     } else {\n       const dtype = getCoordsDataType(rank);\n
checkOutOfBoundsString = `\n       ${dtype} coords = getOutputCoords();\n       `;\n       if (rank === 1) {\n
checkOutOfBoundsString += `\n       result.y = (coords + 1) >= ${this.outputShape[0]} ? 0. : result.y;\n
result.z = 0.;\n       result.w = 0.;\n       `;\n     } else {\n       const channels = getChannels('coords', rank);\n
checkOutOfBoundsString += `\n       bool nextRowOutOfBounds =\n       (${channels[rank - 2]} + 1) >=
${this.outputShape[rank - 2]};\n       bool nextColOutOfBounds =\n       (${channels[rank - 1]} + 1) >=
${this.outputShape[rank - 1]};\n       result.y = nextColOutOfBounds ? 0. : result.y;\n       result.z =
nextRowOutOfBounds ? 0. : result.z;\n       result.w = nextColOutOfBounds || nextRowOutOfBounds ? 0. :
result.w;\n       `;\n     }\n   }\n   this.userCode = `\n   vec4 binaryOperation(vec4 a, vec4 b) {\n
${op}\n   }\n   void main() {\n     vec4 a = getAAtOutCoords();\n     vec4 b = getBAtOutCoords();\n
vec4 result = binaryOperation(a, b);\n     ${checkOutOfBoundsString}\n     setOutput(result);\n   }\n `;\n
}\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {env, KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BinaryOpProgram} from './binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'./binaryop_packed_gpu';\n\nexport const LEAKYRELU = `return (a < 0.) ? b * a : a`;\n\nexport const
LEAKYRELU_PACKED = `\n   vec4 aLessThanZero = vec4(lessThan(a, vec4(0.)));\n   return (aLessThanZero * (b
* a) + ((vec4(1.0) - aLessThanZero) * a));\n`;\n\nexport function leakyRelu(args: {\n   inputs: LeakyReluInputs,\n
backend: MathBackendWebGL,\n   attrs: LeakyReluAttrs\n}): TensorInfo {\n   const {inputs, backend, attrs} =
args;\n   const {x} = inputs;\n   const {alpha} = attrs;\n\n   const $alpha = backend.makeTensorInfo(\n     [],
'float32',\n     util.createScalarValue(alpha as {} as 'float32', 'float32'));\n\n   const program =
env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ?\n     new
BinaryOpPackedProgram(LEAKYRELU_PACKED, x.shape, $alpha.shape) :\n     new
BinaryOpProgram(LEAKYRELU, x.shape, $alpha.shape);\n\n   const result = backend.runWebGLProgram(program,
[x, $alpha], x.dtype);\n\n   backend.disposeIntermediateTensorInfo($alpha);\n\n   return result;\n}\n\nexport const
leakyReluConfig: KernelConfig = {\n   kernelName: LeakyRelu,\n   backendName: 'webgl',\n   kernelFunc: leakyRelu
as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n

```



```

*\n\nimport {env, KernelConfig, KernelFunc, Prelu, PreluInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BinaryOpProgram} from
'../binaryop_gpu';\nimport {BinaryOpPackedProgram} from '../binaryop_packed_gpu';\n\nexport const PRELU =
`return (a < 0.) ? b * a : a;`\n\nexport const PRELU_PACKED = `\n  vec4 aLessThanZero = vec4(lessThan(a,
vec4(0.)));
\n  return (aLessThanZero * (b * a)) + ((vec4(1.0) - aLessThanZero) * a);`\n\n\nexport function
prelu(args: {inputs: PreluInputs, backend: MathBackendWebGL});\n  TensorInfo {\n    const {inputs, backend} =
args;\n    const {x, alpha} = inputs;\n\n    const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS')
?\n      new BinaryOpPackedProgram(PRELU_PACKED, x.shape, alpha.shape) :\n      new
BinaryOpProgram(PRELU, x.shape, alpha.shape);\n    return backend.runWebGLProgram(program, [x, alpha],
x.dtype);\n  }\n\n\nexport const preluConfig: KernelConfig = {\n  kernelName: Prelu,\n  backendName: 'webgl',\n  kernelFunc: prelu as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, BinaryInputs, DataType, env, KernelFunc, TypedArray, UnaryInputs, upcastType}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BinaryOpProgram} from '../binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'../binaryop_packed_gpu';\nimport {complex} from '../kernels/Complex';\nimport {LEAKYRELU,
LEAKYRELU_PACKED} from '../kernels/LeakyRelu';\nimport {PRELU, PRELU_PACKED} from
'../kernels/Prelu';\nimport * as unary_op from '../unaryop_gpu';\nimport {UnaryOpProgram} from
'../unaryop_gpu';\nimport * as unary_packed_op from '../unaryop_packed_gpu';\nimport {UnaryOpPackedProgram}
from '../unaryop_packed_gpu';\nimport {SimpleBinaryKernelImplCPU, SimpleUnaryKernelImplCPU} from
'./shared';\n\nexport const CHECK_NAN_SNIPPET_UNARY = `if (isnan(x)) return x;`\n\nexport const
CHECK_NAN_SNIPPET_BINARY = `\n  if (isnan(a)) return a;\n  if (isnan(b)) return b;`\n\n\nexport const
CHECK_NAN_SNIPPET_BINARY_PACKED = `\n  result.r = isNaN.r > 0. ? NAN : result.r;\n  result.g = isNaN.g
> 0. ? NAN : result.g;\n  result.b = isNaN.b > 0. ? NAN : result.b;\n  result.a = isNaN.a > 0. ? NAN :
result.a;`\n\n\ntype UnaryKernelFuncConfig = {\n  opSnippet: string,\n  packedOpSnippet?: string,\n  cpuKernelImpl?: SimpleUnaryKernelImplCPU,\n  dtype?: DataType\n};\n"/**\n * Template that creates a
`KernelFunc` for unary ops.\n * @param opSnippet Op snippet to create `UnaryOpProgram`\n * @param
packedOpSnippet Op snippet to create `UnaryOpPackedProgram`\n * @param dtype Optional. If set, the result has
this dtype. Otherwise, the\n * result has the same dtype as the first input. This is mainly used in\n * comparison
kernels, such as Equal, Less, Greater, etc.\n */\n\nexport function unaryKernelFunc(\n  {opSnippet,
packedOpSnippet, cpuKernelImpl, dtype}: UnaryKernelFuncConfig):\n  KernelFunc {\n    return ({inputs,
backend}) => {\n      const {x} = inputs as UnaryInputs;\n      const webglBackend = backend as
MathBackendWebGL;\n\n      const $dtype = dtype || x.dtype;\n      if (webglBackend.shouldExecuteOnCPU([x]) &&
cpuKernelImpl != null) {\n        const xData = webglBackend.texData.get(x.dataId);\n        const outValues =
cpuKernelImpl(xData.values as TypedArray, $dtype);\n        return webglBackend.makeTensorInfo(x.shape, $dtype,
outValues);\n      }\n\n      const shouldUsePackedProgram =\n        env().getBool('WEBGL_PACK_UNARY_OPERATIONS') && packedOpSnippet != null;\n      let program:
UnaryOpProgram|UnaryOpPackedProgram;\n      if (shouldUsePackedProgram) {\n        program = new
UnaryOpPackedProgram(x.shape, packedOpSnippet);\n      } else {\n        program = new UnaryOpProgram(x.shape,
opSnippet);\n      }\n\n      return webglBackend.runWebGLProgram(program, [x], $dtype);\n    };}\n\n\ntype
BinaryKernelFuncConfig = {\n  opSnippet: string,\n  packedOpSnippet?: string,\n  checkOutOfBounds?: boolean,\n  supportsComplex?: boolean,\n  cpuKernelImpl?: SimpleBinaryKernelImplCPU,\n  dtype?: DataType\n};\n"/**\n *

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Template that creates a `KernelFunc` for binary ops.\n * @param opSnippet Op snippet to create
`BinaryOpProgram`.\n * @param packedOpSnippet Op snippet to create `BinaryOpPackedProgram`.\n * @param
checkOutOfBoundsForPackedProgram Whether to set checkOutOfBounds=true\n * when creating
BinaryOpPackedProgram.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result
has the same dtype as the first input. This is mainly used in\n * comparison kernels, such as Equal, Less, Greater,
etc.\n * \nexport function binaryKernelFunc({\n opSnippet,\n packedOpSnippet,\n checkOutOfBounds = false,\n
supportsComplex = false,\n cpuKernelImpl,\n dtype\n}: BinaryKernelFuncConfig): KernelFunc {\n return
({inputs, backend}) => {\n const {a, b} = inputs as BinaryInputs;\n const webglBackend = backend as
MathBackendWebGL;\n\n if (supportsComplex && a.dtype === 'complex64') {\n const aData =
webglBackend.texData.get(a.dataId);\n const bData = webglBackend.texData.get(b.dataId);\n\n const [real,
imag] = [\n [aData.complexTensorInfos.real, bData.complexTensorInfos.real],\n
[aData.complexTensorInfos.imag, bData.complexTensorInfos.imag]\n ].map(complexParts => {\n const
[aPart, bPart] = complexParts;\n\n const aHandle = {\n dataId: aPart.dataId,\n dtype: aPart.dtype,\n
shape: a.shape\n };;\n const bHandle = {\n dataId: bPart.dataId,\n dtype: bPart.dtype,\n
shape: b.shape\n };;\n\n const program = new BinaryOpProgram(opSnippet, a.shape, b.shape);\n return
webglBackend.runWebGLProgram(\n program, [aHandle, bHandle], upcastType(aPart.dtype,
bPart.dtype));\n });\n\n const complexOutput =\n complex({inputs: {real, imag}, backend:
webglBackend});\n\n webglBackend.disposeIntermediateTensorInfo(real);\n
webglBackend.disposeIntermediateTensorInfo(imag);\n\n // TODO(annxingyuan): Implement CPU forwarding
for complex inputs.\n\n return complexOutput;\n }\n\n const $dtype = dtype || upcastType(a.dtype,
b.dtype);\n if (webglBackend.shouldExecuteOnCPU([a, b]) && cpuKernelImpl != null) {\n const aData =
webglBackend.texData.get(a.dataId);\n const bData = webglBackend.texData.get(b.dataId);\n const
[outValues, outShape] = cpuKernelImpl(\n a.shape, b.shape, aData.values as TypedArray,\n bData.values
as TypedArray, $dtype);\n\n const out = webglBackend.makeTensorInfo(outShape, $dtype);\n const outData
= webglBackend.texData.get(out.dataId);\n outData.values = outValues;\n return out;\n }\n\n const
shouldUsePackedProgram =\n env().getBool('WEBGL_PACK_BINARY_OPERATIONS') &&\n
packedOpSnippet != null;\n let program: BinaryOpProgram|BinaryOpPackedProgram;\n if
(shouldUsePackedProgram) {\n program = new BinaryOpPackedProgram(\n packedOpSnippet, a.shape,
b.shape, checkOutOfBounds);\n } else {\n program = new BinaryOpProgram(opSnippet, a.shape, b.shape);\n
}\n\n return webglBackend.runWebGLProgram(program, [a, b], $dtype);\n };\n}\n\nexport function
mapActivationToShaderProgram(\n activation: backend_util.Activation, packed = false): string {\n if (activation
=== 'linear') {\n if (packed) {\n return unary_packed_op.LINEAR;\n }\n return unary_op.LINEAR;\n }
else if (activation === 'relu') {\n if (packed) {\n return unary_packed_op.RELU;\n }\n return
unary_op.RELU;\n } else if (activation === 'elu') {\n if (packed) {\n return unary_packed_op.ELU;\n }\n
return unary_op.ELU;\n } else if (activation === 'relu6') {\n if (packed) {\n return
unary_packed_op.RELU6;\n }\n return unary_op.RELU6;\n } else if (activation === 'prelu') {\n if (packed)
{\n return PRELU_PACKED;\n }\n return PRELU;\n } else if (activation === 'leakyrelu') {\n if (packed)
{\n return LEAKYRELU_PACKED;\n }\n return LEAKYRELU;\n }\n\n throw new Error(`Activation ${\n
activation} has not been implemented for the WebGL backend.`);\n }\n}\n\n"/**\n * @license\n * Copyright 2018
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
\n * \n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class MatMulPackedProgram implements
GPGPUProgram {\n variableNames = ['matrixA', 'matrixB'];\n packedInputs = true;\n packedOutput = true;\n

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outputShape: number[];\n userCode: string;\n\n constructor(\n    aShape: [number, number, number], bShape:
[number, number, number],\n    outputShape: [number, number, number], transposeA = false,\n    transposeB =
false, addBias = false, activation: string = null,\n    hasPreluActivation = false, hasLeakyreluActivation = false) {\n
    this.outputShape = outputShape;\n\n    const sharedDim = transposeA ? aShape[1] : aShape[2];\n    const
sharedDimensionPacked = Math.ceil(sharedDim / 2);\n\n    const aSample = transposeA ? 'i * 2, rc.y' : 'rc.y, i * 2';\n
    const bSample = transposeB ? 'rc.z, i * 2' : 'i * 2, rc.z';\n    const aSwizzle = transposeA ? ['a.xxyz', 'a.zzww'] :
['a.xzzz', 'a.yyww'];\n    const bSwizzle = transposeB ? ['b.xzzz', 'b.ywyw'] : ['b.xyxy', 'b.zwzw'];\n\n    let
activationSnippet = "", applyActivationSnippet = "";\n    if (activation) {\n        if (hasPreluActivation) {\n
activationSnippet = `vec4 activation(vec4 a) {\n            vec4 b = getPreluActivationWeightsAtOutCoords();\n
    ${activation}\n        }`; \n    } else if (hasLeakyreluActivation) {\n        activationSnippet = `vec4 activation(vec4 a)
{\n            vec4 b = getLeakyreluAlphaAtOutCoords();\n            ${activation}\n        }`; \n    } else {\n
activationSnippet = `vec4 activation(vec4 x) {\n            ${activation}\n        }`; \n    }\n\n    applyActivationSnippet
= `result = activation(result);`; \n    }\n\n    const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : "";\n
    if (addBias) {\n        this.variableNames.push('bias');\n    }\n\n    if (hasPreluActivation) {\n
this.variableNames.push('preluActivationWeights');\n    }\n\n    if (hasLeakyreluActivation) {\n
this.variableNames.push('leakyreluAlpha');\n    }\n\n    let batchASnippet = 'rc.x';\n    let batchBSnippet = 'rc.x';\n
    if (aShape[0] < bShape[0]) {\n        batchASnippet = `int(min(float(rc.x), ${aShape[0] - 1}));`\n    } else if
(bShape[0] < aShape[0]) {\n        batchBSnippet = `int(min(float(rc.x), ${bShape[0] - 1}));`\n    }\n\n    this.userCode
= `\n        ${activationSnippet}\n        const float sharedDimension = ${sharedDimensionPacked}.0;\n        vec4
dot2x2ARowBCol(ivec3 rc) {\n            vec4 result = vec4(0);\n            for (int i = 0; i < ${sharedDimensionPacked}; i++)
{\n                int batchA = ${batchASnippet};\n                int batchB = ${batchBSnippet};\n                vec4 a =
getMatrixA(batchA, ${aSample});\n                vec4 b = getMatrixB(batchB, ${bSample});\n                // These swizzled
products need to be separately added.\n                // See: https://github.com/tensorflow/tfjs/issues/1735\n                result +=
(${aSwizzle[0]} * ${bSwizzle[0]});\n                result += (${aSwizzle[1]} * ${bSwizzle[1]});\n            }\n            return
result;\n        }\n\n        void main() {\n            ivec3 rc = getOutputCoords();\n            vec4 result =
dot2x2ARowBCol(rc);\n            ${addBiasSnippet}\n            ${applyActivationSnippet}\n            setOutput(result);\n
        }\n    `;\n    }\n\n    /**\n     * @license\n     * Copyright 2018 Google LLC. All Rights Reserved.\n     * Licensed under
the Apache License, Version 2.0 (the "License");\n     * you may not use this file except in compliance with the
License.\n     * You may obtain a copy of the License at\n     * http://www.apache.org/licenses/LICENSE-2.0\n     * Unless
required by applicable law or agreed to in writing, software\n     * distributed under the License is distributed
on an "AS IS" BASIS,\n     * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n     * See the License for the specific language governing permissions and\n     * limitations under the
License.\n     */

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*\n\nimport {backend_util} from 'tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\n//
(Ar + Ai)(Br + Bi) =\n// ArBr + ArBi + AiBr + AiBi = ArBr - AB + ArBi + AiBr\n// Yr = ArBr - AB\n// Yi = ArBi
+ AiBr\n\nexport const COMPLEX_MULTIPLY = {\n    REAL: 'return areal * breal - aimag * bimag;',\n    IMAG:
'return areal * bimag + aimag * breal;'\n};\n\nexport class BinaryOpComplexProgram implements GPGPUProgram
{\n    variableNames = ['AReal', 'AImag', 'BReal', 'BImag'];\n    userCode: string;\n    outputShape: number[];\n\n
constructor(op: string, aShape: number[], bShape: number[]) {\n        this.outputShape =
backend_util.assertAndGetBroadcastShape(aShape, bShape);\n\n        this.userCode = `\n            float
binaryOpComplex(\n                float areal, float aimag, float breal, float bimag) {\n                    ${op}\n                }\n\n
            void main() {\n                float areal = getARealAtOutCoords();\n                float aimag = getAImagAtOutCoords();\n
                float breal = getBRealAtOutCoords();\n                float bimag = getBImagAtOutCoords();\n                setOutput(binaryOpComplex(areal,
aimag, breal, bimag));\n            }\n        `;\n    }\n\n    /**\n     * @license\n     * Copyright 2020 Google LLC. All Rights
Reserved.\n     * Licensed under the Apache License, Version 2.0 (the "License");\n     * you may not use this file
except in compliance with the License.\n     * You may obtain a copy of the License at\n     * http://www.apache.org/licenses/LICENSE-2.0\n
     * Unless required by applicable law or agreed to in writing,

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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {ReshapePackedProgram} from './reshape_packed_gpu';\nimport {getBatchDim, getRowsCols} from './webgl_util';\n\nexport function packedReshape(\n  input: TensorInfo, afterShape: number[],\n  backend: MathBackendWebGL): TensorInfo {\n  const input3DShape =\n    [getBatchDim(input.shape),\n     ...getRowsCols(input.shape)] as [number, number, number];\n  const input3D: TensorInfo = {\n    dtype: input.dtype,\n    shape: input3DShape,\n    dataId: input.dataId\n  }; \n  const afterShapeAs3D =\n    [getBatchDim(afterShape),\n     ...getRowsCols(afterShape)] as [number, number, number];\n  const program = new ReshapePackedProgram(afterShapeAs3D, input3DShape);\n  const preventEagerUnpackingOfOutput = true;\n  const output = backend.runWebGLProgram(\n    program, [input3D], input.dtype, null /* customSetup */,\n    preventEagerUnpackingOfOutput);\n  return {dataId: output.dataId, shape: afterShape, dtype: output.dtype};\n}\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {packedReshape} from './kernel_utils/reshape';\nimport {isReshapeFree} from './webgl_util';\n\nexport function reshape(args: {\n  inputs: ReshapeInputs,\n  backend: MathBackendWebGL,\n  attrs: ReshapeAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n  const webglBackend = backend;\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n  const $xSize = util.sizeFromShape($shape);\n  util.assert(\n    xSize === $xSize,\n    () => `The new shape (${ $shape }) has ${ $xSize } elements and the old ` +\n      `shape (${ x.shape }) has ${ xSize } elements. The new shape and old ` +\n      `shape must have the same number of elements.`);\n  const xTexData = webglBackend.texData.get(x.dataId);\n  if (xTexData.isPacked && !isReshapeFree(x.shape, $shape) &&\n    !(xTexData.texture !== null && isReshapeFree(xTexData.shape, $shape))) {\n    return packedReshape(x, $shape, webglBackend);\n  }\n  webglBackend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'webgl',\n  kernelFunc: reshape as {} as KernelFunc\n};\n\n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class MeanProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n  constructor(reduceInfo: backend_util.ReduceInfo, divisor?: number) {\n    const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n    this.outputShape = [batchSize, outSize];\n    const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n    const
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windowSizeVec4Remainder = windowSize % 4;\n\n let updateSnippet = `sumValue += dot(values, ones);`\n if
(divisor != null) {\n const denominator = 1 / divisor;\n updateSnippet = `sumValue += dot(values * ${\n
util.isInt(denominator) ? denominator.toPrecision(2) :\n denominator}, ones);`\n }\n\n let
checkOutOfBounds = ";\n if (inSize % windowSize > 0) {\n checkOutOfBounds = `\n if (inIdx < 0 || inIdx
>= ${inSize}) {\n return 0.0;\n }\n `;\n }\n\n this.userCode = `\n const vec4 ones = vec4(1.0,
1.0, 1.0, 1.0);\n\n float getValue(int batch, int inIdx) {\n ${checkOutOfBounds}\n return getX(batch,
inIdx);\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n int batch = coords[0];\n int
outIdx = coords[1];\n int inOffset = outIdx * ${windowSize};\n\n float sumValue = 0.0;\n\n for (int i =
0; i < ${windowSizeNearestVec4}; i += 4) {\n int inIdx = inOffset + i;\n vec4 values = vec4(\n
getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n
getValue(batch, inIdx + 3)\n );\n\n ${updateSnippet}\n }\n\n int inIdx = inOffset +
${windowSizeNearestVec4};\n if (${windowSizeVec4Remainder} === 1) {\n vec4 values =
vec4(getValue(batch, inIdx), 0.0, 0.0, 0.0);\n\n ${updateSnippet}\n } else if
(${windowSizeVec4Remainder} === 2) {\n vec4 values = vec4(\n getValue(batch, inIdx),\n
getValue(batch, inIdx + 1), 0.0, 0.0);\n\n ${updateSnippet}\n } else if (${windowSizeVec4Remainder}
=== 3) {\n vec4 values = vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n
getValue(batch, inIdx + 2), 0.0);\n\n ${updateSnippet}\n }\n\n setOutput(sumValue);\n }\n `;\n
}\n\n", "/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
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by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class ReduceProgram implements GPGPUProgram {\n variableNames = ['x'];\n
outputShape: number[];\n userCode: string;\n\n constructor(\n reduceInfo: backend_util.ReduceInfo,\n
reduceType: 'all'|'any'|'max'|'min'|'sum'|'prod') {\n const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n
this.outputShape = [batchSize, outSize];\n\n let initializationValue = '0.0';\n let compareOp = ``;\n\n if
(reduceType === 'prod') {\n initializationValue = '1.0';\n } else if (reduceType === 'min') {\n // WebGL on
Firefox Linux can't compile 1/0 so we do 1/eps.\n initializationValue = '1.0 / 1e-20';\n compareOp = `min`;\n
} else if (reduceType === 'max') {\n // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n
initializationValue = '-1.0 / 1e-20';\n compareOp = `max`;\n }\n\n let returnValue =
`${reduceType}(${reduceType}(${reduceType})^ +\n 'minMaxValue[0], minMaxValue[1], minMaxValue[2]),
minMaxValue[3]');\n\n if (reduceType === 'sum') {\n returnValue = `sumValue`; \n } else if (reduceType ===
'prod') {\n returnValue = `prodValue`; \n } else if (reduceType === 'all') {\n returnValue = `allValue`; \n
} else if (reduceType === 'any') {\n returnValue = `anyValue`; \n }\n\n const windowSizeNearestVec4 =
Math.floor(windowSize / 4) * 4;\n const windowSizeVec4Remainder = windowSize % 4;\n\n let updateSnippet
= `\n if (${reduceType} === 'sum') {\n sumValue += dot(values, ones);\n } else if (${reduceType} ===
'prod') {\n vec2 tmp = vec2(values[0], values[1]) * vec2(values[2], values[3]);\n prodValue *= tmp[0] *
tmp[1];\n } else {\n minMaxValue = ${compareOp}(values, minMaxValue);\n }\n `;\n\n let vecType
= `vec4`;\n\n if (reduceType === 'all') {\n initializationValue = '1.0';\n updateSnippet = `\n bool
reducedAllValue = all(values);\n float floatedReducedAllValue = float(reducedAllValue);\n allValue =
float(allValue >= 1.0 && floatedReducedAllValue >= 1.0);\n `;\n vecType = `bvec4`; \n } else if
(reduceType === 'any') {\n initializationValue = '0.0';\n updateSnippet = `\n bool reducedAnyValue =
any(values);\n float floatedReducedAnyValue = float(reducedAnyValue);\n anyValue = float(anyValue >=
1.0 || floatedReducedAnyValue >= 1.0);\n `;\n vecType = `bvec4`; \n }\n\n let checkOutOfBounds = ";\n
if (inSize % windowSize > 0) {\n checkOutOfBounds = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n

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return initializationValue;\n    }\n    `;\n    }\n    this.userCode = \n    const float initializationValue =
${initializationValue};\n    const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n    float getValue(int batch, int inIdx) {\n
    ${checkOutOfBounds}\n    return getX(batch, inIdx);\n    }\n\n    void main() {\n    ivec2 coords =
getOutputCoords();\n    int batch = coords[0];\n    int outIdx = coords[1];\n    int inOffset = outIdx *
${windowSize};\n\n    vec4 minMaxValue = vec4(${initializationValue});\n    float prodValue = 1.0;\n
float sumValue = 0.0;\n    float allValue = 1.0;\n    float anyValue = 0.0;\n\n    for (int i = 0; i <
${windowSizeNearestVec4}; i += 4) {\n    int inIdx = inOffset + i;\n    ${vecType} values = ${vecType}(\n
    getValue(batch, inIdx),\n    getValue(batch, inIdx + 1),\n    getValue(batch, inIdx + 2),\n
getValue(batch, inIdx + 3)\n    );\n    ${updateSnippet}\n    }\n\n    int inIdx = inOffset +
${windowSizeNearestVec4};\n    if (${windowSizeVec4Remainder} === 1) {\n    ${vecType} values =
${vecType}(\n    getValue(batch, inIdx),\n    initializationValue,\n    initializationValue,\n
initializationValue\n    );\n\n    ${updateSnippet}\n    } else if (${windowSizeVec4Remainder} === 2) {\n
    ${vecType} values = ${vecType}(\n    getValue(batch, inIdx),\n    getValue(batch, inIdx + 1),\n
initializationValue,\n    initializationValue\n    );\n\n    ${updateSnippet}\n    } else if
(${windowSizeVec4Remainder} === 3) {\n    ${vecType} values = ${vecType}(\n    getValue(batch,
inIdx),\n    getValue(batch, inIdx + 1),\n    getValue(batch, inIdx + 2),\n    initializationValue\n
);\n\n    ${updateSnippet}\n    }\n    setOutput(${returnValue});\n    }\n    `;\n    }\n}\n\n"/**\n * @license\n
 * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util, DataType, TensorInfo} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {MeanProgram} from '../mean_gpu';\nimport
{ReduceProgram} from '../reduce_gpu';\n\nntype ReduceTypes = 'all'|'any'|'max'|'min'|'sum'|'prod'|'mean';\n\n//
Returns an array of configuration objects that describe each stage of the\n// reduction.\n\nfunction
getReductionStages(inShape: number[]):\n    Array<{inSize: number, windowSize: number, outSize: number}> {\n
const stages = [];\n\n    while (stages.length === 0 || stages[stages.length - 1].outSize !== 1) {\n    const outSize:
number =\n    stages.length ? stages[stages.length - 1].outSize : inShape[1];\n    const windowSize =
backend_util.computeOptimalWindowSize(outSize);\n    stages.push({\n    inSize: outSize,\n    windowSize,\n
outSize: Math.ceil(outSize / windowSize)\n    });\n    }\n\n    return stages;\n    }\n\n\nexport function reduce(\n    x:
TensorInfo, dtype: DataType, reductionType: ReduceTypes,\n    backend: MathBackendWebGL): TensorInfo {\n
const reductionStages = getReductionStages(x.shape);\n\n    let result = x;\n    for (let i = 0; i < reductionStages.length;
i++) {\n    const {inSize, windowSize, outSize} = reductionStages[i];\n\n    let program:
ReduceProgram|MeanProgram;\n    let previousResult: TensorInfo;\n    if (reductionType === 'mean') {\n
program = i === 0 ?\n    new MeanProgram(\n    {windowSize, inSize, batchSize: x.shape[0], outSize},
inSize) :\n    new MeanProgram({windowSize, inSize, batchSize: x.shape[0], outSize});\n    } else {\n
program = new ReduceProgram(\n    {windowSize, inSize, batchSize: x.shape[0], outSize}, reductionType);\n
}\n\n    previousResult = result;\n    result = backend.runWebGLProgram(program, [result], dtype);\n\n    if
(previousResult.dataId !== x.dataId) {\n    backend.disposeIntermediateTensorInfo(previousResult);\n    }\n    }\n\n
return result;\n    }\n\n"/**\n * @license\n
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Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the

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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
 './shader_compiler';\n\nexport class TransposeProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  constructor(aShape: number[], newDim:
  number[]) {\n    const outputShape: number[] = new Array(aShape.length);\n    for (let i = 0; i < outputShape.length;\n  i++) {\n      outputShape[i] = aShape[newDim[i]];\n    }\n    this.outputShape = outputShape;\n    this.rank =
  outputShape.length;\n    const dtype = getCoordsDataType(this.rank);\n    const switched =
  getSwitchedCoords(newDim);\n    this.userCode = `\n  void main() {\n    ${dtype} resRC =
  getOutputCoords();\n    setOutput(getA(${switched}));\n  }\n  `;\n  }\n\n  function
  getSwitchedCoords(newDim: number[]): string {\n    const rank = newDim.length;\n    if (rank > 6) {\n      throw
  Error(`Transpose for rank ${rank} is not yet supported`);\n    }\n    const originalOrder = [\n      'resRC.x', 'resRC.y',
  'resRC.z', 'resRC.w', 'resRC.u', 'resRC.v'];\n    const switchedCoords = new Array(rank);\n    for (let i = 0; i <
  newDim.length; i++) {\n      switchedCoords[newDim[i]] = originalOrder[i];\n    }\n    return
  switchedCoords.join();\n  }\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
  under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless
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  on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *
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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getVecChannels} from './packing_util';\nimport
  {getCoordsDataType} from './shader_compiler';\n\nexport class TransposePackedProgram implements
  GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(aShape: number[], newDim: number[]) {\n    const
  outputShape: number[] = new Array(aShape.length);\n    for (let i = 0; i < outputShape.length; i++) {\n
  outputShape[i] = aShape[newDim[i]];\n    }\n    this.outputShape = outputShape;\n    this.rank =
  outputShape.length;\n    if (this.rank > 6) {\n      throw Error(`Packed transpose for rank ${this.rank} is not
  yet supported.`);\n    }\n    const dtype = getCoordsDataType(this.rank);\n    const outputOrder =
  getVecChannels('rc', this.rank);\n    const switchedOrder = new Array(this.rank);\n    for (let i = 0; i <
  newDim.length; i++) {\n      switchedOrder[newDim[i]] = outputOrder[i];\n    }\n    const innerDims =
  `vec2(${switchedOrder.slice(-2).join()})`; \n    const nextColumn =\n      `++${outputOrder[this.rank - 1]} <
  ${outputShape[this.rank - 1]}`;\n    const getc = `getChannel(getA(${switchedOrder.join()}), ${innerDims})`; \n\n
  this.userCode = `\n  void main() {\n    ${dtype} rc = getOutputCoords();\n    vec4 result = vec4(0.);\n
  result[0] = ${getc};\n    if (${nextColumn}) {\n      result[1] = ${getc};\n    }\n    --${outputOrder[this.rank -
  1]};\n    if (++${outputOrder[this.rank - 2]} < ${outputShape[this.rank - 2]}) {\n      result[2] = ${getc};\n
  if (${nextColumn}) {\n      result[3] = ${getc};\n    }\n  }\n  setOutput(result);\n  }\n  `;\n  }\n}\n", "/*\n *
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  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
  language governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {backend_util, sumOutType, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport
  {MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from './kernel_utils/reduce';\nimport {reshape}
  from './Reshape';\nimport {transposeImpl} from './Transpose_impl';\n\nexport function sumImpl(\n  x:
```

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TensorInfo, axis: number|number[], keepDims: boolean,\n  backend: MathBackendWebGL): TensorInfo {\n  const
reductionIndices = axis;\n  const xRank = x.shape.length;\n  const origAxes =
util.parseAxisParam(reductionIndices, x.shape);\n  let axes = origAxes;\n  const permutedAxes =
backend_util.getAxesPermutation(axes, xRank);\n  const sumInputIsTransposed = permutedAxes != null;\n  let
sumInput = x;\n  if (sumInputIsTransposed) {\n    sumInput = transposeImpl(x, permutedAxes, backend);\n  } axes
= backend_util.getInnerMostAxes(axes.length, xRank);\n  } backend_util.assertAxesAreInnerMostDims('sum',
axes, xRank);\n  const [sumOutShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(sumInput.shape, axes);\n  let outShape = sumOutShape;\n  if
(keepDims) {\n    // rather than reshape at the end, set the target shape here.\n    outShape =
backend_util.expandShapeToKeepDim(sumOutShape, origAxes);\n  }\n  const inSize =
util.sizeFromShape(reduceShape);\n  const xSize = util.sizeFromShape(x.shape);\n  const batchSize = xSize /
inSize;\n  const reshapedInput = reshape(\n    {inputs: {x: sumInput}, attrs: {shape: [batchSize, inSize]},
backend});\n  const outType = sumOutType(x.dtype);\n  const reduced = reduce(reshapedInput, outType, 'sum',
backend);\n  const out =\n    reshape({inputs: {x: reduced}, attrs: {shape: outShape}, backend});\n  backend.disposeIntermediateTensorInfo(reshapedInput);\n  backend.disposeIntermediateTensorInfo(reduced);\n  if
(sumInputIsTransposed) {\n    backend.disposeIntermediateTensorInfo(sumInput);\n  }\n  return out;\n}\n"/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {sumImpl} from './Sum_impl';\nexport function
sum(\n  args: {inputs: SumInputs, attrs: SumAttrs, backend: MathBackendWebGL}) {\n  const {inputs, backend,
attrs} = args;\n  const {x} = inputs;\n  const {axis, keepDims} = attrs;\n  return sumImpl(x, axis, keepDims,
backend);\n}\n\nexport const sumConfig: KernelConfig = {\n  kernelName: Sum,\n  backendName: 'webgl',\n
kernelFunc: sum as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {backend_util, TensorInfo, upcastType, util} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {mapActivationToShaderProgram} from
'./kernel_utils/kernel_funcs_utils';\nimport {MatMulPackedProgram} from './mulmat_packed_gpu';\nimport
{multiply} from './Multiply';\nimport {reshape} from './Reshape';\nimport {sum} from './Sum';\nimport {transpose}
from './Transpose';\n\n// Empirically determined minimal shared dimension in matmul before we forward\n// to
a.mul(b).sum() in order to take advantage of GPU parallelism. See\n// https://github.com/tensorflow/tfjs-
core/pull/1379 for benchmarks.\nexport const MATMUL_SHARED_DIM_THRESHOLD = 1000;\n\nntype
BatchMatMulConfig = {\n  a: TensorInfo,\n  b: TensorInfo,\n  transposeA: boolean,\n  transposeB: boolean,\n
backend: MathBackendWebGL,\n  bias?: TensorInfo,\n  preluActivationWeights?: TensorInfo,\n  leakyreluAlpha?:
number,\n  activation?: backend_util.Activation\n};\n\nexport function batchMatMulImpl({\n  a,\n  b,\n
transposeA,\n  transposeB,\n  backend,\n  bias = null,\n  preluActivationWeights = null,\n  leakyreluAlpha = 0,\n
activation = null\n}: BatchMatMulConfig): TensorInfo {\n  const aRank = a.shape.length;\n  const bRank =

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b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const
innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ?
a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank -
1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA =
util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const
batchDimsCompatible =\n   batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n
util.assert(\n   aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n   () => `Error in matMul: the input
batch dimensions must either be the ` +\n     `same or at least one input batch dimension must be 1. Got input `
+\n     `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n
batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n\n const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n   innerShapeA === innerShapeB,\n
() => `Error in matMul: inner shapes (${innerShapeA}) and ` +\n     `${innerShapeB}) of Tensors with shapes
${a.shape} and ` +\n     `${b.shape} and transposeA=${transposeA}` +\n     ` and transposeB=${transposeB}
must match.`);\n\n const a3dShape: [number, number, number] = transposeA ?\n   [batchDimA, innerShapeA,
outerShapeA] :\n   [batchDimA, outerShapeA, innerShapeA];\n\n const b3dShape: [number, number, number] =
transposeB ?\n   [batchDimB, outerShapeB, innerShapeB] :\n   [batchDimB, innerShapeB, outerShapeB];\n\n //
The rest of the implementation is designed to operate on rank-3 tensors\n\n const a3d = reshape({inputs: {x: a},
backend, attrs: {shape: a3dShape}});\n\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape:
b3dShape}});\n\n const intermediates: TensorInfo[] = [a3d, b3d];\n\n const batchDim = Math.max(batchDimA,
batchDimB);\n\n const sharedDim = transposeA ? a3d.shape[1] : a3d.shape[2];\n\n const hasBias = bias != null;\n\n
const hasPreluActivationWeights = preluActivationWeights != null;\n\n const hasLeakyreluAlpha = activation ===
'leakyrelu';\n\n const fusedActivation = activation != null ?\n   mapActivationToShaderProgram(activation, true) :\n
null;\n\n const containsFusedOps = hasBias || hasPreluActivationWeights ||\n   hasLeakyreluAlpha ||
fusedActivation != null;\n\n let out: TensorInfo;\n\n // Since the matrices are vectors, it is faster to call mul().sum()\n
// because sum() is O(sqrt(N)) due to divide-and-conquer.\n\n if ((outerShapeA === 1 || outerShapeB === 1) &&\n
sharedDim > MATMUL_SHARED_DIM_THRESHOLD && containsFusedOps === false) {\n   let aVec = a3d;\n
let bVec = b3d;\n   if (transposeA) {\n     aVec = transpose({inputs: {x: a3d}, backend, attrs: {perm: [0, 2, 1]}});\n
intermediates.push(aVec);\n   }\n   if (transposeB) {\n     bVec = transpose({inputs: {x: b3d}, backend, attrs:
{perm: [0, 2, 1]}});\n     intermediates.push(bVec);\n   }\n\n   const shouldReshapeA = outerShapeB !== 1;\n
const shouldReshapeB = outerShapeB === 1;\n\n   let aVec3d = aVec;\n   if (shouldReshapeA) {\n     aVec3d =
reshape({\n     inputs: {x: aVec},\n     backend,\n     attrs: {shape: [batchDim, sharedDim, 1]}\n   });\n\n
intermediates.push(aVec3d);\n   }\n\n   const axis = outerShapeB === 1 ? 2 : 1;\n\n   let bVec3d = bVec;\n   if
(shouldReshapeB) {\n     bVec3d = reshape({\n     inputs: {x: bVec},\n     backend,\n     attrs: {shape:
[batchDim, 1, sharedDim]}\n   });\n\n   intermediates.push(bVec3d);\n   }\n\n   const product =
multiply({inputs: {a: aVec3d, b: bVec3d}, backend});\n   out = sum({inputs: {x: product}, backend, attrs: {axis,
keepDims: true}});\n   intermediates.push(product);\n } else {\n   const dtype = upcastType(a.dtype, b.dtype);\n
const program = new MatMulPackedProgram(\n   a3dShape, b3dShape, [batchDim, outerShapeA, outerShapeB],
transposeA,\n   transposeB, hasBias, fusedActivation, hasPreluActivationWeights,\n
hasLeakyreluAlpha);\n\n   const inputs: TensorInfo[] = [a3d, b3d];\n   if (bias != null) {\n     inputs.push(bias);\n
}\n   if (hasPreluActivationWeights) {\n     inputs.push(reluActivationWeights);\n   }\n   if (hasLeakyreluAlpha)
{\n     const $leakyreluAlpha = backend.makeTensorInfo(\n     [], 'float32',\n
util.createScalarValue(leakyreluAlpha as { } as 'float32', 'float32'));\n     inputs.push($leakyreluAlpha);\n
intermediates.push($leakyreluAlpha);\n   }\n\n   out = backend.runWebGLProgram(program, inputs, dtype);\n
}\n\n const outReshaped =\n   reshape({inputs: {x: out}, backend, attrs: {shape: outShape}});\n\n
intermediates.push(out);\n for (const i of intermediates) {\n   backend.disposeIntermediateTensorInfo(i);\n }\n
return outReshaped;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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```
=====  
*\n\nimport { _FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc } from  
'@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from './backend_webgl';\nimport { batchMatMulImpl }  
from './BatchMatMul_impl';\n\nexport function _fusedMatMul(args: { inputs: _FusedMatMulInputs, attrs:  
_FusedMatMulAttrs, backend: MathBackendWebGL }) { \n  const { inputs, backend, attrs } = args;\n  const { a, b, bias, preluActivationWeights } = inputs;\n  const { transposeA, transposeB, activation, leakyreluAlpha } = attrs;\n  return batchMatMulImpl({ a, b, transposeA, transposeB, backend, bias, preluActivationWeights, leakyreluAlpha, activation });\n}\n\nexport const _fusedMatMulConfig:  
KernelConfig = { \n  kernelName: _FusedMatMul, \n  backendName: 'webgl', \n  kernelFunc: _fusedMatMul as { } as  
KernelFunc, \n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the  
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License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n */
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=====  
*\n\nimport { Acos, KernelConfig } from '@tensorflow/tfjs-core';\nimport { unaryKernelFunc } from  
 './kernel_utils/kernel_funcs_utils';\nimport { CHECK_NAN_SNIPPET } from './unaryop_gpu';\nconst ACOS =  
CHECK_NAN_SNIPPET +`\n  if (abs(x) > 1.) {\n    return NAN;\n  }\n  return acos(x);`;\n\nexport const acos =  
unaryKernelFunc({ opSnippet: ACOS });\n\nexport const acosConfig: KernelConfig = { \n  kernelName: Acos, \n  backendName: 'webgl', \n  kernelFunc: acos, \n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights  
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file  
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */
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=====  
*\n\nimport { Acosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { unaryKernelFunc } from  
 './kernel_utils/kernel_funcs_utils';\nimport { CHECK_NAN_SNIPPET } from './unaryop_gpu';\nconst ACOSH =  
CHECK_NAN_SNIPPET +`\n  if (x < 1.0) return NAN;\n  return log(x + sqrt(x * x - 1.0));`;\n\nexport const acosh =  
unaryKernelFunc({ opSnippet: ACOSH });\n\nexport const acoshConfig: KernelConfig = { \n  kernelName: Acosh, \n  backendName: 'webgl', \n  kernelFunc: acosh, \n};\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights  
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file  
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */
```

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=====  
*\n\nimport { GPGPUProgram } from './gpgpu_math';\n\nexport class AddNProgram implements GPGPUProgram  
{ \n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n  constructor(outputShape:  
number[], shapes: number[][] ) { \n    this.outputShape = outputShape;\n    this.variableNames = shapes.map( (_, i) =>
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`T${i}`);\n\n  const snippets: string[] = [];\n  // Get target elements from every input tensor.\n  this.variableNames.forEach(variable => {\n    snippets.push(`float v${variable} =\n  get${variable}AtOutCoords();`);\n  });\n\n  // Calculate the sum of all elements.\n  const operation =\n  this.variableNames\n    .map(variable => {\n      return `v${variable}`;\n    })\n    .join(' + ');\n\n  this.userCode = `\n  void main() {\n    ${snippets.join("\n    ")}\n\n    float result = ${operation};\n    setOutput(result);\n  }\n  `;\n  }\n  }\n  }\n  }", "/*\n * @license\n * Copyright 2019\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class AddNPackedProgram implements\nGPGPUProgram {\n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n  packedInputs =\n  true;\n  packedOutput = true;\n\n  constructor(outputShape: number[], shapes: number[][]){\n    this.outputShape =\n    outputShape;\n    this.variableNames = shapes.map( (_, i) => `T${i}`);\n    const snippets: string[] = [];\n    // Get\n    target elements from every input tensor.\n    this.variableNames.forEach(variable => {\n      snippets.push(`vec4\n    v${variable} = get${variable}AtOutCoords();`);\n    });\n\n    // Calculate the sum of all elements.\n    const\n    operation = this.variableNames\n      .map(variable => {\n        return `v${variable}`;\n      })\n      .join(' + ');\n\n    this.userCode = `\n    void main() {\n      ${snippets.join("\n      ")}\n\n      vec4 result = ${operation};\n      setOutput(result);\n    }\n    `;\n  }\n  }\n  }\n  }", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {AddN, AddNInputs, env, KernelConfig, KernelFunc, TensorInfo, upcastType} from\n '@tensorflow/tfjs-core';\n\nimport {AddNProgram} from './addn_gpu';\n\nimport {AddNPackedProgram} from\n './addn_packed_gpu';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {identity} from\n './Identity';\n\nexport function addN(args: {inputs: AddNInputs, backend: MathBackendWebGL}):\n TensorInfo\n {\n  const {inputs, backend} = args;\n  const tensors = inputs;\n  if (tensors.length === 1) {\n    return\n    identity({inputs: {x: tensors[0]}, backend});\n  }\n\n  // Limit the number of uploaded textures for optimization.\n  if\n  (tensors.length > env().get('WEBGL_MAX_TEXTURES_IN_SHADER')) {\n    const midIndex =\n    Math.floor(tensors.length / 2);\n    const leftSide = addN({inputs: tensors.slice(0, midIndex), backend});\n    const\n    rightSide = addN({inputs: tensors.slice(midIndex), backend});\n    return addN({inputs: [leftSide, rightSide],\n    backend});\n  }\n\n  const dtype =\n  tensors.map(t => t.dtype).reduce((d1, d2) => upcastType(d1, d2));\n  const\n  shapes = tensors.map(t => t.shape);\n  // We can make sure shapes are identical in op level.\n  const usePackedOp =\n  env().getBool('WEBGL_PACK');\n  const program = usePackedOp ?\n  new\n  AddNPackedProgram(tensors[0].shape, shapes) :\n  new AddNProgram(tensors[0].shape, shapes);\n  return\n  backend.runWebGLProgram(program, tensors, dtype);\n}\n\nexport const addNConfig: KernelConfig = {\n  kernelName: AddN,\n  backendName: 'webgl',\n  kernelFunc: addN as {\n  } as KernelFunc\n};\n  }", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

```

WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { reduce } from './kernel_utils/reduce';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\nexport function all(\n  args: { inputs: AllInputs, backend: MathBackendWebGL, attrs: AllAttrs }):\n  TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { x } = inputs;\n    const { axis, keepDims } = attrs;\n\n    const xRank = x.shape.length;\n    const origAxes = util.parseAxisParam(axis, x.shape);\n    let axes = origAxes;\n    const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n    let permutedX = x;\n    if (permutedAxes != null) {\n      permutedX = transpose({ inputs: { x }, backend, attrs: { perm: permutedAxes } });\n      axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    }\n\n    backend_util.assertAxesAreInnerMostDims('all', axes, xRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n    const inSize = util.sizeFromShape(reduceShape);\n\n    const a2D =\n      reshape({ inputs: { x: permutedX }, backend, attrs: { shape: [-1, inSize] } });\n    const reduced = reduce(a2D, a2D.dtype, 'all', backend);\n\n    let res;\n    if (keepDims) {\n      const newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n      res = reshape({ inputs: { x: reduced }, backend, attrs: { shape: newShape } });\n    } else {\n      res = reshape({ inputs: { x: reduced }, backend, attrs: { shape: outShape } });\n    }\n\n    backend.disposeIntermediateTensorInfo(a2D);\n    backend.disposeIntermediateTensorInfo(reduced);\n\n    if (permutedAxes != null) {\n      backend.disposeIntermediateTensorInfo(permutedX);\n    }\n\n    return res;\n  }\n\nexport const allConfig:\n  KernelConfig = {\n    kernelName: All,\n    backendName: 'webgl',\n    kernelFunc: all as {\n    KernelFunc\n  };n", /**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { reduce } from './kernel_utils/reduce';\nimport { reshape } from './Reshape';\nimport { transpose } from './Transpose';\nexport function any(\n  args: { inputs: AnyInputs, backend: MathBackendWebGL, attrs: AnyAttrs }):\n  TensorInfo {\n    const { inputs, backend, attrs } = args;\n    const { x } = inputs;\n    const { axis, keepDims } = attrs;\n\n    const xRank = x.shape.length;\n    const origAxes = util.parseAxisParam(axis, x.shape);\n    let axes = origAxes;\n    const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n    let permutedX = x;\n    if (permutedAxes != null) {\n      permutedX = transpose({ inputs: { x }, backend, attrs: { perm: permutedAxes } });\n      axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    }\n\n    backend_util.assertAxesAreInnerMostDims('any', axes, xRank);\n    const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n    const inSize = util.sizeFromShape(reduceShape);\n\n    const a2D =\n      reshape({ inputs: { x: permutedX }, backend, attrs: { shape: [-1, inSize] } });\n    const reduced = reduce(a2D, a2D.dtype, 'any', backend);\n\n    let res;\n    if (keepDims) {\n      const newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n      res = reshape({ inputs: { x: reduced }, backend, attrs: { shape: newShape } });\n    } else {\n      res = reshape({ inputs: { x: reduced }, backend, attrs: { shape: outShape } });\n    }\n\n    backend.disposeIntermediateTensorInfo(a2D);\n    backend.disposeIntermediateTensorInfo(reduced);\n\n    if (permutedAxes != null) {\n      backend.disposeIntermediateTensorInfo(permutedX);\n    }\n\n    return res;\n  }\n\nexport const anyConfig:
```

KernelConfig = {\n kernelName: Any,\n backendName: 'webgl',\n kernelFunc: any as { } as
KernelFunc\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from  
 './gpgpu_math';\n\nexport class ArgMinMaxProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    reduceInfo: backend_util.ReduceInfo, op:  
 'max'|'min',\n    firstPass: boolean) {\n    const {windowSize, batchSize, outSize} = reduceInfo;\n    if (!firstPass)  
    {\n      this.variableNames.push('bestIndicesA');\n    }\n    this.outputShape = [batchSize, outSize];\n    const  
    compOp = (op === 'max') ? '>' : '<';\n    const indexSnippet = firstPass ?\n      'inOffset + i;'\n      :\n      'round(getBestIndicesA(batch, inOffset + i));'\n    this.userCode = `\n    void main() {\n      ivec2 coords =  
      getOutputCoords();\n      int batch = coords[0];\n      int outIdx = coords[1];\n      int inOffset = outIdx *  
      ${windowSize};\n      int bestIndex = inOffset;\n      float bestValue = getA(batch, bestIndex);\n      for (int i  
      = 0; i < ${windowSize}; i++) {\n        int inIdx = ${indexSnippet};\n        float candidate = getA(batch, inIdx);\n        if (candidate ${compOp} bestValue) {\n          bestValue = candidate;\n          bestIndex = inIdx;\n        }\n      }\n      setOutput(float(bestIndex));\n    }\n  `;\n}\n"/**\n * @license\n * Copyright 2019 Google LLC.  
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this  
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\nimport  
{getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class  
ArgMinMaxPackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n    shape: number[],  
    windowSize: number, op: 'max'|'min',\n    firstPass: boolean) {\n    util.assert(\n      shape.length > 2,\n      () =>  
      `Packed arg${op}.charAt(0).toUpperCase() +  
      op.slice(1) supports only inputs with rank above  
      2.`);\n    const inSize = shape[shape.length - 1];\n    const outSize = Math.ceil(inSize / windowSize);\n    this.outputShape = shape.slice(0, -1);\n    if (outSize > 1) {\n      this.outputShape.push(outSize);\n    }\n    if  
    (!firstPass) {\n      this.variableNames.push('bestIndicesA');\n    }\n    const outShape = this.outputShape;\n    const  
    rank = outShape.length;\n    const dtype = getCoordsDataType(rank);\n    const coords = getChannels('coords',  
    rank);\n\n    let sourceLocSetup;\n    let sourceRank;\n    if (outSize === 1) {\n      sourceRank = rank + 1;\n      const  
      sourceLocDType = getCoordsDataType(sourceRank);\n      sourceLocR = ${sourceLocDType}(${coords.join()}, 0);\n      ++${coords[rank - 1]};\n      ${sourceLocDType}  
      sourceLocG = ${sourceLocDType}(${coords.join()}, 0);\n      ++${coords[rank - 2]};\n      ${sourceLocDType}  
      sourceLocA = ${sourceLocDType}(${coords.join()}, 0);\n      --${coords[rank - 1]};\n      ${sourceLocDType}  
      sourceLocB = ${sourceLocDType}(${coords.join()}, 0);\n      --${coords[rank - 2]};\n    } else {\n      sourceRank = rank;\n      sourceLocSetup = `\n      ${dtype} sourceLocR = coords;\n      ++${coords[rank - 1]};\n      ${dtype} sourceLocG = coords;\n      ++${coords[rank - 2]};\n      ${dtype} sourceLocA = coords;\n      --  
      ${coords[rank - 1]};\n      ${dtype} sourceLocB = coords;\n      --${coords[rank - 2]};\n    `;\n    const channels =  
    ['x', 'y', 'z', 'w', 'u', 'v'].slice(0, sourceRank);\n    const inChannel = '.' + channels[sourceRank - 1]; // e.g. \"b\" for
```

```

rank 3.\n  const intChannels = channels.map(x => 'int ' + x);\n  const srcRCoords =\n  getChannels('sourceLocR', sourceRank - 1).concat('inIdx.r');\n  const srcGCoords =\n  getChannels('sourceLocG', sourceRank - 1).concat('inIdx.g');\n  const srcBCoords =\n  getChannels('sourceLocB', sourceRank - 1).concat('inIdx.b');\n  const srcACoords =\n  getChannels('sourceLocA', sourceRank - 1).concat('inIdx.a');\n\n  const compOp = (op === 'max') ? 'greaterThan' :\n  'lessThan';\n  const fetchCandidateIdx = firstPass ? " : "\n    inIdx =\n  round(vec4(getBestIndicesAChannel(${srcRCoords.join()}),\n  getBestIndicesAChannel(${srcGCoords.join()}),\n  getBestIndicesAChannel(${srcBCoords.join()}),\n  getBestIndicesAChannel(${srcACoords.join()})));\n\n  const fetchValue = `vec4(\n  getAChannel(${srcRCoords.join()}),\n  hasNextCol ? getAChannel(${srcGCoords.join()}) : 0.,\n  hasNextRow ? getAChannel(${srcBCoords.join()}) : 0.,\n  hasNextRow && hasNextCol ?\n  getAChannel(${srcACoords.join()}) : 0.`;\n\n  const getBestIndicesAChannelSnippet = firstPass ? " : "\n  float\n  getBestIndicesAChannel(${intChannels.join()}) {\n    return getChannel(getBestIndicesA(${channels.join()}),\n    vec2(${channels.slice(-2).join()}));\n  };\n\n  this.userCode = `\n  float\n  getAChannel(${intChannels.join()}) {\n    return getChannel(getA(${channels.join()}),\n    vec2(${channels.slice(-2).join()}));\n  }\n  ${getBestIndicesAChannelSnippet}\n  void main() {\n  ${dtype} coords = getOutputCoords();\n    bool hasNextCol = ${coords[rank - 1]} < ${outShape[rank - 1] - 1};\n    bool hasNextRow = ${coords[rank - 2]} < ${outShape[rank - 2] - 1};\n    ${sourceLocSetup}\n    ivec4\n  srcIdx = ivec4(sourceLocR${inChannel}, sourceLocG${inChannel},\n    sourceLocB${inChannel},\n    sourceLocA${inChannel}) * ${windowSize};\n    ivec4 inIdx = srcIdx;\n    vec4 bestIndex = vec4(inIdx);\n    vec4 bestValue = ${fetchValue};\n    for (int i = 0; i < ${windowSize}; i++) {\n      inIdx = srcIdx;\n      ${fetchCandidateIdx}\n      vec4 candidate = ${fetchValue};\n      bvec4 nan = isnan(candidate);\n      bvec4\n  replace = bvec4(\n    vec4(${compOp}(candidate, bestValue)) * (vec4(1.0) - vec4(nan));\n    bestValue =\n  vec4(replace.x ? candidate.x : bestValue.x,\n    replace.y ? candidate.y : bestValue.y,\n    replace.z ? candidate.z : bestValue.z,\n    replace.w ? candidate.w : bestValue.w);\n      bestIndex\n  = mix(bestIndex, vec4(inIdx), vec4(replace));\n      srcIdx++;\n    }\n    setOutput(bestIndex);\n  }\n  `;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache\n  License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You\n  may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required\n  by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n  BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the\n  License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {ArgMinMaxProgram}\n  from './argminmax_gpu';\nimport {ArgMinMaxPackedProgram} from './argminmax_packed_gpu';\nimport\n  {MathBackendWebGL} from './backend_webgl';\nimport {reshape} from './kernels/Reshape';\n\nfunction\n  argReduce(\n  backend: MathBackendWebGL, x: TensorInfo, reduceType: 'max'|'min',\n  bestIndicesA:\n  TensorInfo = null): TensorInfo {\n  let batchSize = x.shape[0];\n  let inSize = x.shape[1];\n  if (bestIndicesA != null)\n  {\n    batchSize = bestIndicesA.shape[0];\n    inSize = bestIndicesA.shape[1];\n  }\n  const windowSize =\n  backend_util.computeOptimalWindowSize(inSize);\n  const reduceInfo =\n  {windowSize, inSize, batchSize,\n  outSize: Math.ceil(inSize / windowSize)};\n  const program =\n  new ArgMinMaxProgram(reduceInfo,\n  reduceType, bestIndicesA == null);\n  const inputs = [x];\n  if (bestIndicesA != null) {\n  inputs.push(bestIndicesA);\n  }\n  const output = backend.runWebGLProgram(program, inputs, 'int32');\n  // No\n  need to run another GPGPU program.\n  if (output.shape[1] === 1) {\n    return output;\n  }\n  const result =\n  argReduce(backend, x, reduceType, output);\n  backend.disposeIntermediateTensorInfo(output);\n  return\n  result;\n}\n\nfunction argReducePacked(\n  backend: MathBackendWebGL, x: TensorInfo, reduceType:\n  'max'|'min',\n  bestIndicesA: TensorInfo = null): TensorInfo {\n  const inShape = bestIndicesA != null ?

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bestIndicesA.shape : x.shape;\n const inSize = inShape[inShape.length - 1];\n const windowSize =
backend_util.computeOptimalWindowSize(inSize);\n const program = new ArgMinMaxPackedProgram(\n
inShape, windowSize, reduceType, bestIndicesA == null);\n const inputs = bestIndicesA == null ? [x] : [x,
bestIndicesA];\n const output = backend.runWebGLProgram(program, inputs, 'int32');\n if (output.shape.length
=== x.shape.length) {\n const result = argReducePacked(backend, x, reduceType, output);\n
backend.disposeIntermediateTensorInfo(output);\n return result;\n }\n return output;\n}\n\nexport function
argMinMaxReduce(\n backend: MathBackendWebGL, x: TensorInfo, axis: number,\n reduceType: 'min'|'max');\n
TensorInfo {\n const axes = [axis];\n backend_util.assertAxesAreInnerMostDims(\n 'arg' +
reduceType.charAt(0).toUpperCase() + reduceType.slice(1), axes,\n x.shape.length);\n if
(!env().getBool('WEBGL_PACK_REDUCE') || x.shape.length <= 2) {\n const intermediateTensorInfos = [];\n
const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(x.shape, axes);\n const inSize
= util.sizeFromShape(reduceShape);\n const a2D = reshape({inputs: {x}, backend, attrs: {shape: [-1, inSize]}});\n
intermediateTensorInfos.push(a2D);\n\n const reduced = argReduce(backend, a2D, reduceType);\n
intermediateTensorInfos.push(reduced);\n const reshaped =\n reshape({inputs: {x: reduced}, backend, attrs:
{shape: outShape}});\n\n intermediateTensorInfos.forEach(\n t =>\n
backend.disposeIntermediateTensorInfo(t);\n return reshaped;\n }\n return argReducePacked(backend, x,
reduceType);\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport { ArgMax, ArgMaxAttrs, ArgMaxInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\n\nimport
{ argMinMaxReduce } from '../kernel_utils/arg_min_max';\n\nimport { transpose } from '../Transpose';\n\nexport
function argMax(\n args:\n {inputs: ArgMaxInputs, backend: MathBackendWebGL, attrs: ArgMaxAttrs});\n
TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis} = attrs;\n let axes =
util.parseAxisParam(axis, x.shape);\n const permutedAxes = backend_util.getAxesPermutation(axes,
x.shape.length);\n let $x = x;\n const intermediateTensorInfos = [];\n if (permutedAxes != null) {\n $x =
transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n\n intermediateTensorInfos.push($x);\n axes =
backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('argMax', [axes[0]], $x.shape.length);\n const out =
argMinMaxReduce(backend, $x, axes[0], 'max');\n\n intermediateTensorInfos.forEach(\n t =>\n
backend.disposeIntermediateTensorInfo(t);\n return out;\n)\n\nexport const argMaxConfig: KernelConfig = {\n
kernelName: ArgMax,\n backendName: 'webgl',\n kernelFunc: argMax as {} as KernelFunc\n};\n\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport { ArgMin, ArgMinAttrs, ArgMinInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util }
from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\n\nimport
{ argMinMaxReduce } from '../kernel_utils/arg_min_max';\n\nimport { transpose } from '../Transpose';\n\nexport
function argMin(\n args:\n {inputs: ArgMinInputs, backend: MathBackendWebGL, attrs: ArgMinAttrs});\n

```

```

TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis} = attrs;\n\n let axes =
util.parseAxisParam(axis, x.shape);\n const permutedAxes = backend_util.getAxesPermutation(axes,
x.shape.length);\n let $x = x;\n const intermediateTensorInfos = [];\n if (permutedAxes != null) {\n $x =
transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n intermediateTensorInfos.push($x);\n axes =
backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('argMin', [axes[0]], $x.shape.length);\n\n const out =
argMinMaxReduce(backend, $x, axes[0], 'min');\n\n intermediateTensorInfos.forEach(\n t =>
backend.disposeIntermediateTensorInfo(t));\n return out;\n}\n\nexport const argMinConfig: KernelConfig = {\n
kernelName: ArgMin,\n backendName: 'webgl',\n kernelFunc: argMin as { } as KernelFunc\n};\n\n", "/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Asin, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ASIN =
CHECK_NAN_SNIPPET +`\n if (abs(x) > 1.) {\n return NAN;\n }\n return asin(x);\n`;\n\nexport const asin =
unaryKernelFunc({opSnippet: ASIN});\n\nexport const asinConfig: KernelConfig = {\n kernelName: Asin,\n
backendName: 'webgl',\n kernelFunc: asin,\n};\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Asinh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ASINH =
CHECK_NAN_SNIPPET +`return log(x + sqrt(x * x + 1.0));`\n\nexport const asinh =
unaryKernelFunc({opSnippet: ASINH});\n\nexport const asinhConfig: KernelConfig = {\n kernelName: Asinh,\n
backendName: 'webgl',\n kernelFunc: asinh,\n};\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {Atan, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ATAN =
CHECK_NAN_SNIPPET +`\n return atan(x);\n`;\n\nexport const atan = unaryKernelFunc({opSnippet:
ATAN});\n\nexport const atanConfig: KernelConfig = {\n kernelName: Atan,\n backendName: 'webgl',\n
kernelFunc: atan,\n};\n\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {Atan2} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc, CHECK_NAN_SNIPPET_BINARY, CHECK_NAN_SNIPPET_BINARY_PACKED} from './kernel_utils/kernel_funcs_utils';\nconst ATAN2 = CHECK_NAN_SNIPPET_BINARY + `\n return atan(a, b);`\n;\nconst ATAN2_PACKED = `\n vec4 result = atan(a, b);\n vec4 isNaN = min(vec4(isnan(a)) + vec4(isnan(b)), vec4(1.0));`\n +\nCHECK_NAN_SNIPPET_BINARY_PACKED + `\n return result;`\n;\n\nexport const atan2 =\nbinaryKernelFunc({opSnippet: ATAN2, packedOpSnippet: ATAN2_PACKED});\n\nexport const atan2Config: KernelConfig = {\n kernelName: Atan2,\n backendName: 'webgl',\n kernelFunc: atan2,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n*\n\nimport {Atanh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from './unaryop_gpu';\nconst ATANH = CHECK_NAN_SNIPPET + `\n if ((x < -1.0) || (x > 1.0)) return NaN;\nreturn (log(1.0 + x) - log(1.0 - x)) / 2.0;`\n;\n\nexport const atanh = unaryKernelFunc({opSnippet: ATANH});\n\nexport const atanhConfig: KernelConfig = {\n kernelName: Atanh,\n backendName: 'webgl',\n kernelFunc: atanh,\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Pool2DProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n convInfo: backend_util.Conv2DInfo, poolType: 'max'|'avg',\n computePositions: boolean, flattenPositions = false,\n includeBatchInIndex = false) {\n if (poolType === 'avg' && computePositions) {\n throw new Error('Cannot compute positions for average pool.);\n }\n\n const filterWidth = convInfo.filterWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n const effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n const padTop = convInfo.padInfo.top;\n const padLeft = convInfo.padInfo.left;\n\n this.outputShape = convInfo.outShape;\n\n const isAvgPool = poolType === 'avg';\n\n const batchFlattenPositionStr = `((batch * ${convInfo.inHeight} + xR) * ${convInfo.inWidth} + xC) * ${convInfo.inChannels} + d`;\n const flattenPositionStr = `(xR * ${convInfo.inWidth} + xC) * ${convInfo.inChannels} + d`;\n\n let initializationValue = '0.0';\n if (!isAvgPool) {\n // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n initializationValue = '-1.0 / 1e-20';\n }\n\n if (computePositions) {\n const compareOp = '>=';\n\n this.userCode = `\n const ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n void main() {\n ivec4 coords = getOutputCoords();\n int batch = coords[0];\n int d = coords[3];\n\n ivec2 xRCCorner =\n\n=====\n
```

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coords.yz * strides - pads;\n      int xRCorner = xRCCorner.x;\n      int xCCorner = xRCCorner.y;\n\n      //\n      max/min x(?, ?, d) to get y(yR, yC, d).\n      // ? = to be determined\n      float minMaxValue = 0.0;\n      float\n      minMaxValueFound = 0.0;\n      int minMaxPosition = 0;\n      float avgValue = 0.0;\n\n      for (int wR = 0;\n      wR < ${effectiveFilterHeight};\n      wR += ${dilationHeight}) {\n      int xR = xRCorner + wR;\n\n      if (xR < 0 || xR >= ${convInfo.inHeight}) {\n      continue;\n      }\n\n      for (int wC = 0; wC <\n      ${effectiveFilterWidth};\n      wC += ${dilationWidth}) {\n      int xC = xCCorner + wC;\n\n      if\n      (xC < 0 || xC >= ${convInfo.inWidth}) {\n      continue;\n      }\n\n      float value = getX(batch, xR,\n      xC, d);\n\n      // If a min / max value has already been found, use it. If not,\n      // use the current value.\n      float currMinMaxValue = mix(\n      value, minMaxValue, minMaxValueFound);\n      if (value\n      ${compareOp} currMinMaxValue) {\n      minMaxValue = value;\n      minMaxValueFound = 1.0;\n\n      minMaxPosition = ${\n      flattenPositions ? (includeBatchInIndex ? batchFlattenPositionStr :\n      flattenPositionStr) :\n      `wR * ${effectiveFilterWidth} + wC`};\n      }\n      }\n      setOutput(float(minMaxPosition));\n      }\n      `;\n      return;\n      }\n\n      const compareOp =\n      'max';\n\n      let returnValue = `${poolType}(${poolType}(${poolType})C +\n      'minMaxValue[0],\n      minMaxValue[1], minMaxValue[2]), minMaxValue[3]`;\n      if (poolType === 'avg') {\n      returnValue =\n      `avgValue / count`;\n      }\n\n      const filterWidthNearestVec4 = Math.floor(filterWidth / 4) * 4;\n      const\n      filterWidthVec4Remainder = filterWidth % 4;\n\n      const updateSnippet = `\n      if (${isAvgPool}) {\n      avgValue += dot(values, ones);\n      } else {\n      minMaxValue = ${compareOp}(values, minMaxValue);\n      }\n      `;\n\n      this.userCode = `\n      const ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n      const ivec2\n      pads = ivec2(${padTop}, ${padLeft});\n      const float initializationValue = ${initializationValue};\n      const vec4\n      ones = vec4(1.0, 1.0, 1.0, 1.0);\n      float count = 0.0;\n\n      float getValue(int batch, int xR, int xC, int d) {\n      if (xC < 0 || xC >= ${convInfo.inWidth}) {\n      return initializationValue;\n      }\n      count += 1.0;\n\n      return getX(batch, xR, xC, d);\n      }\n\n      void main() {\n      ivec4 coords = getOutputCoords();\n      int batch\n      = coords[0];\n      int d = coords[3];\n      ivec2 xRCCorner = coords.yz * strides - pads;\n      int xRCorner =\n      xRCCorner.x;\n      int xCCorner = xRCCorner.y;\n\n      // max/min x(?, ?, d) to get y(yR, yC, d).\n      // ? = to\n      be determined\n      vec4 minMaxValue = vec4(${initializationValue});\n      float avgValue = 0.0;\n      count =\n      0.0;\n\n      for (int wR = 0; wR < ${effectiveFilterHeight};\n      wR += ${dilationHeight}) {\n      int xR =\n      xRCorner + wR;\n\n      if (xR < 0 || xR >= ${convInfo.inHeight}) {\n      continue;\n      }\n\n      for (int\n      wC = 0; wC < ${filterWidthNearestVec4}; wC += 4) {\n      int xC = xCCorner + wC * ${dilationWidth};\n\n      vec4 values = vec4(\n      getValue(batch, xR, xC, d),\n      getValue(batch, xR, xC +\n      ${dilationWidth}, d),\n      getValue(batch, xR, xC + 2 * ${dilationWidth}, d),\n      getValue(batch, xR,\n      xC + 3 * ${dilationWidth}, d)\n      );\n\n      ${updateSnippet}\n      }\n\n      int xC = xCCorner +\n      ${filterWidthNearestVec4};\n      if (${filterWidthVec4Remainder} === 1) {\n      vec4 values = vec4(\n      getValue(batch, xR, xC, d),\n      initializationValue,\n      initializationValue,\n      initializationValue\n      );\n\n      ${updateSnippet}\n      } else if (${filterWidthVec4Remainder} === 2) {\n      vec4 values = vec4(\n      getValue(batch, xR, xC, d),\n      getValue(batch, xR, xC +\n      ${dilationWidth}, d),\n      initializationValue,\n      initializationValue\n      );\n\n      ${updateSnippet}\n      } else if (${filterWidthVec4Remainder} === 3) {\n      vec4 values = vec4(\n      getValue(batch, xR, xC, d),\n      getValue(batch, xR, xC + ${dilationWidth}, d),\n      getValue(batch, xR,\n      xC + 2 * ${dilationWidth}, d),\n      initializationValue\n      );\n\n      ${updateSnippet}\n      }\n      }\n      setOutput(${returnValue});\n      }\n      `;\n      }\n      }\n\n      export class Pool3DProgram implements\n      GPGPUProgram {\n      variableNames = ['x'];\n      outputShape: number[];\n      userCode: string;\n\n      constructor(\n      convInfo: backend_util.Conv3DInfo, poolType: 'max'|'avg',\n      computePositions: boolean, flattenPositions =\n      false,\n      includeBatchInIndex = false) {\n      if (poolType === 'avg' && computePositions) {\n      throw new\n      Error('Cannot compute positions for average pool.);\n      }\n\n      const filterWidth = convInfo.filterWidth;\n      const\n      strideDepth = convInfo.strideDepth;\n      const strideHeight = convInfo.strideHeight;\n      const strideWidth =\n      convInfo.strideWidth;\n      const dilationDepth = convInfo.dilationDepth;\n      const dilationHeight =\n      convInfo.dilationHeight;\n      const dilationWidth = convInfo.dilationWidth;\n      const effectiveFilterDepth =

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convInfo.effectiveFilterDepth;\n  const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n  const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n  const padFront = convInfo.padInfo.front;\n  const
padTop = convInfo.padInfo.top;\n  const padLeft = convInfo.padInfo.left;\n  this.outputShape =
convInfo.outShape;\n\n  const isAvgPool = poolType === 'avg';\n  let initializationValue = '0.0';\n  if
(!isAvgPool) {\n    // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n    initializationValue = '-1.0 /
1e-20';\n  }\n\n  if (computePositions) {\n    const compareOp = '>=';\n    this.userCode = `\n    const ivec3
strides =\n      ivec3(${strideDepth}, ${strideHeight}, ${strideWidth});\n    const ivec3 pads =
ivec3(${padFront}, ${padTop}, ${padLeft});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int
batch = coords.x;\n      int ch = coords.u;\n\n      ivec3 xCorner = ivec3(coords.y, coords.z, coords.w) *
strides - pads;\n      int xDCorner = xCorner.x;\n      int xRCorner = xCorner.y;\n      int xCCorner =
xCorner.z;\n\n      // max/min x(?, ?, ?, ch) to get y(yD, yR, yC, ch).\n      // ? = to be determined\n      float
minMaxValue = 0.0;\n      float minMaxValueFound = 0.0;\n      int minMaxPosition = 0;\n\n      for (int wD
= 0; wD < ${effectiveFilterDepth};\n        wD += ${dilationDepth}) {\n        int xD = xDCorner + wD;\n\n        if
(xD < 0 || xD >= ${convInfo.inDepth}) {\n          continue;\n        }\n\n        for (int wR = 0; wR <
${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n          int xR = xRCorner + wR;\n\n          if
(xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n          }\n\n          for (int wC = 0; wC <
${effectiveFilterWidth};\n            wC += ${dilationWidth}) {\n            int xC = xCCorner + wC;\n\n            if
(xC < 0 || xC >= ${convInfo.inWidth}) {\n              continue;\n            }\n\n            float value =
getX(batch, xD, xR, xC, ch);\n\n            // If a min / max value has already been found, use it. If not,\n            //
use the current value.\n            float currMinMaxValue = mix(\n              value, minMaxValue,\n              minMaxValueFound);\n            if (value ${compareOp} currMinMaxValue) {\n              minMaxValue =
value;\n              minMaxValueFound = 1.0;\n              minMaxPosition = ${\n                flattenPositions ?\n                (includeBatchInIndex ?\n                  `(((batch * ${convInfo.inDepth} + xD) * ${\n
convInfo.inHeight} + xR) * ${convInfo.inWidth} + xC) * ${\n
convInfo.inChannels} + ch` :\n                  `(xD * ${convInfo.inHeight} + xR) * ${\n
convInfo.inWidth} + xC) * ${convInfo.inChannels} +
ch`)\n                }\n              }\n            }\n            }\n            }\n          }\n        }\n      }\n      setOutput(float(minMaxPosition));\n    }\n    `;\n    return;\n  }\n\n  const compareOp = 'max';\n  let
returnValue = `${poolType}(${poolType})(${poolType})(` +\n    'minMaxValue[0], minMaxValue[1],\n    minMaxValue[2]), minMaxValue[3]';\n  if (poolType === 'avg') {\n    returnValue = `avgValue / count`;\n  }\n\n  const filterWidthNearestVec4 = Math.floor(filterWidth / 4) * 4;\n  const filterWidthVec4Remainder =
filterWidth % 4;\n\n  const updateSnippet = `\n  if (${isAvgPool}) {\n    avgValue += dot(values, ones);\n  } else {\n    minMaxValue = ${compareOp}(values, minMaxValue);\n  }\n  `;\n  this.userCode = `\n  const ivec3
strides =\n    ivec3(${strideDepth}, ${strideHeight}, ${strideWidth});\n  const ivec3 pads =
ivec3(${padFront}, ${padTop}, ${padLeft});\n  const float initializationValue = ${initializationValue};\n  const
vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n  float count = 0.0;\n  float getValue(int batch, int xD, int xR, int
xC, int ch) {\n    if (xC < 0 || xC >= ${convInfo.inWidth}) {\n      return initializationValue;\n    }\n    count
+= 1.0;\n    return getX(batch, xD, xR, xC, ch);\n  }\n\n  void main() {\n    ivec5 coords =
getOutputCoords();\n    int batch = coords.x;\n    int ch = coords.u;\n    ivec3 xCorner = ivec3(coords.y,
coords.z, coords.w) * strides - pads;\n    int xDCorner = xCorner.x;\n    int xRCorner = xCorner.y;\n    int
xCCorner = xCorner.z;\n\n    // max/min x(?, ?, ?, d) to get y(yD, yR, yC, ch).\n    // ? = to be determined\n    vec4
minMaxValue = vec4(${initializationValue});\n    float avgValue = 0.0;\n    count = 0.0;\n\n    for (int
wD = 0; wD < ${effectiveFilterDepth};\n      wD += ${dilationDepth}) {\n      int xD = xDCorner + wD;\n\n      if
(xD < 0 || xD >= ${convInfo.inDepth}) {\n        continue;\n      }\n\n      for (int wR = 0; wR <
${effectiveFilterHeight};\n        wR += ${dilationHeight}) {\n        int xR = xRCorner + wR;\n\n        if (xR
< 0 || xR >= ${convInfo.inHeight}) {\n          continue;\n        }\n\n        for (int wC = 0; wC <
${filterWidthNearestVec4}; wC += 4) {\n          int xC = xCCorner + wC * ${dilationWidth};\n\n          vec4
values = vec4(\n            getValue(batch, xD, xR, xC, ch),\n            getValue(batch, xD, xR, xC +

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    ${dilationWidth}, ch),\n          getValue(batch, xD, xR, xC + 2 * ${dilationWidth}, ch),\n
    getValue(batch, xD, xR, xC + 3 * ${dilationWidth}, ch)\n          );\n          ${updateSnippet}\n          }\n\n
    int xC = xCCorner + ${filterWidthNearestVec4};\n          if (${filterWidthVec4Remainder === 1}) {\n
    vec4 values = vec4(\n          getValue(batch, xD, xR, xC, ch),\n          initializationValue,\n
    initializationValue,\n          initializationValue)\n          );\n          ${updateSnippet}\n          } else if
    (${filterWidthVec4Remainder === 2}) {\n          vec4 values = vec4(\n          getValue(batch, xD, xR, xC,
    ch),\n          getValue(batch, xD, xR, xC + ${dilationWidth}, ch),\n          initializationValue,\n
    initializationValue\n          );\n          ${updateSnippet}\n          } else if (${filterWidthVec4Remainder ===
    3}) {\n          vec4 values = vec4(\n          getValue(batch, xD, xR, xC, ch),\n          getValue(batch, xD, xR,
    xC + ${dilationWidth}, ch),\n          getValue(batch, xD, xR, xC + 2 * ${dilationWidth}, ch),\n
    initializationValue\n          );\n          ${updateSnippet}\n          }\n          }\n\n
    setOutput(${returnValue});\n    }\n    }\n    `;\n    }\n    }"/**\n * @license\n * Copyright 2020 Google LLC. All
    Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
    file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
    http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
    software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
    OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
    governing permissions and\n * limitations under the License.\n *

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=====
*\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from
'/Identity';\n\nexport function avgPool(args: {\n  inputs: AvgPoolInputs,\n  backend: MathBackendWebGL,\n  attrs:
AvgPoolAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n
  assertNotComplex(x, 'avgPool');\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const dilations =
  1;\n\n  util.assert(\n    backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n    () => 'Error in
  avgPool: Either strides or dilations must be 1. '\n    `Got strides ${strides} and dilations '${dilations}'`);\n\n
  const convInfo = backend_util.computePool2DInfo(\n    x.shape as [number, number, number, number], filterSize,
  strides,\n    dilations, pad, dimRoundingMode);\n  if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1
  &&\n    util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n    return identity({inputs: {x}, backend});\n
  }\n  const avgPoolProgram = new Pool2DProgram(convInfo, 'avg', false);\n  return
  backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n}\n\nexport const avgPoolConfig: KernelConfig =
  {\n  kernelName: AvgPool,\n  backendName: 'webgl',\n  kernelFunc: avgPool as {} as KernelFunc\n};\n"/**\n *
  @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
  2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
  copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
  law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
  language governing permissions and\n * limitations under the License.\n *

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=====
*\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs, backend_util, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool3DProgram} from '../pool_gpu';\n\nexport function avgPool3D(args: {\n  inputs: AvgPool3DInputs,\n
  backend: MathBackendWebGL,\n  attrs: AvgPool3DAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
  args;\n  const {x} = inputs;\n  const {filterSize, strides, pad, dimRoundingMode, dataFormat} = attrs;\n  const
  dilations: [number, number, number] = [1, 1, 1];\n\n  const convInfo = backend_util.computePool3DInfo(\n
  x.shape as [number, number, number, number, number], filterSize, strides,\n    dilations, pad, dimRoundingMode,
  dataFormat);\n  const avgPoolProgram = new Pool3DProgram(convInfo, 'avg', false);\n  return

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backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n\n\nexport const avgPool3DConfig: KernelConfig =
{\n  kernelName: AvgPool3D,\n  backendName: 'webgl',\n  kernelFunc: avgPool3D as {\n
KernelFunc\n};\n"},/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'/gpgpu_math';\n\nexport class AvgPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =
convInfo.dilationWidth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padTop = effectiveFilterHeight - 1 -
convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const avgMultiplier
= 1 / (filterHeight * filterWidth);\n\n    this.userCode = `\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n
    const float avgMultiplier = float(${avgMultiplier});\n\n    void main() {\n      ivec4 coords =
getOutputCoords();\n      int b = coords[0];\n      int d = coords[3];\n\n      ivec2 dyRCCorner = coords.yz -
pads;\n      int dyRCorner = dyRCCorner.x;\n      int dyCCorner = dyRCCorner.y;\n\n      // Convolve dy(?, ?, d)
with pos mask(:, :, d) to get dx(xR, xC, d).\n      // ? = to be determined. := across all values in that axis.\n      float
dotProd = 0.0;\n      for (int wR = 0; wR < ${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n
float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR = int(dyR);\n\n          for (int wC = 0; wC <
${effectiveFilterWidth};\n              wC += ${dilationWidth}) {\n                float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n\n                if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                    fract(dyC) > 0.0) {\n
continue;\n                }\n                int idyC = int(dyC);\n\n                float dyValue = getDy(b, idyR, idyC, d);\n\n
dotProd += dyValue * avgMultiplier;\n              }\n            }\n          setOutput(dotProd);\n        }\n      }\n\n\nexport
class AvgPool3DBackpropProgram implements GPGPUProgram {\n  variableNames = ['dy'];\n  outputShape:
number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape =
convInfo.inShape;\n    const filterDepth = convInfo.filterDepth;\n    const filterHeight = convInfo.filterHeight;\n
const filterWidth = convInfo.filterWidth;\n    const strideDepth = convInfo.strideDepth;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationDepth =
convInfo.dilationDepth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =
convInfo.dilationWidth;\n    const effectiveFilterDepth = convInfo.effectiveFilterDepth;\n    const
effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const effectiveFilterWidth =
convInfo.effectiveFilterWidth;\n\n    const padFront = effectiveFilterDepth - 1 - convInfo.padInfo.front;\n    const
padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 -
convInfo.padInfo.left;\n\n    const avgMultiplier = 1 / (filterDepth * filterHeight * filterWidth);\n\n    this.userCode
= `\n    const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n    const float avgMultiplier =
float(${avgMultiplier});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int batch = coords.x;\n
      int ch = coords.u;\n\n      ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n      int dyDCorner =
dyCorner.x;\n      int dyRCorner = dyCorner.y;\n      int dyCCorner = dyCorner.z;\n\n      // Convolve dy(?, ?, ?,
d) with pos mask(:, :, :, ch) to get\n      // dx(xD, xR, xC, ch).\n      // ? = to be determined. := across all values in
that axis.\n      float dotProd = 0.0;\n\n      for (int wD = 0; wD < ${effectiveFilterDepth};\n          wD +=

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    float dyD = float(dyDCorner + wD) / ${strideDepth}.0;\n\n    if (dyD < 0.0 || dyD
    >= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n        continue;\n    }\n    int idyD = int(dyD);\n\n    for (int wR = 0; wR < ${effectiveFilterHeight};\n        wR += ${dilationHeight}) {\n        float dyR =
    float(dyRCorner + wR) / ${strideHeight}.0;\n\n        if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||\n        fract(dyR) > 0.0) {\n            continue;\n        }\n        int idyR = int(dyR);\n\n        for (int wC = 0; wC <
    ${effectiveFilterWidth};\n            wC += ${dilationWidth}) {\n            float dyC = float(dyCCorner + wC) /
    ${strideWidth}.0;\n\n            if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n            fract(dyC) > 0.0) {\n                continue;\n            }\n            int idyC = int(dyC);\n\n            float dyValue = getDy(batch, idyD, idyR,
    idyC, ch);\n\n            dotProd += dyValue * avgMultiplier;\n        }\n    }\n\n    setOutput(dotProd);\n    }\n    `;\n    }\n}\n\n",/*\n * @license\n * Copyright 2020 Google LLC. All Rights
    Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
    except in compliance with the License.\n * You may obtain a copy of the License at\n *
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    software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
    OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
    governing permissions and\n * limitations under the License.\n *

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=====\n
*\nimport {AvgPool3DGrad, AvgPool3DGradAttrs, AvgPool3DGradInputs, backend_util, KernelConfig,
KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {AvgPool3DBackpropProgram} from
'./avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from './backend_webgl';\n\nexport function
avgPool3DGrad(args: {\n  inputs: AvgPool3DGradInputs,\n  backend: MathBackendWebGL,\n  attrs:
AvgPool3DGradAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {dy, input} = inputs;\n
  const x = input;\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const dilations: [number, number,
  number] = [1, 1, 1];\n\n  const convInfo = backend_util.computePool3DInfo(\n    x.shape as [number, number,
  number, number, number, number], filterSize, strides,\n    dilations, pad, dimRoundingMode);\n  const
avgPoolBackpropProgram = new AvgPool3DBackpropProgram(convInfo);\n  return
backend.runWebGLProgram(avgPoolBackpropProgram, [dy], x.dtype);\n}\n\nexport const avgPoolGrad3DConfig:
KernelConfig = {\n  kernelName: AvgPool3DGrad,\n  backendName: 'webgl',\n  kernelFunc: avgPool3DGrad as {}
as KernelFunc\n};\n",/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY
KIND, either express or implied.\n * See the License for the specific language governing permissions and\n *
limitations under the License.\n *

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*\nimport {AvgPoolGrad, AvgPoolGradAttrs, AvgPoolGradInputs, backend_util, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {AvgPool2DBackpropProgram} from
'./avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from './backend_webgl';\nimport
{assertNotComplex} from './webgl_util';\n\nexport function avgPoolGrad(args: {\n  inputs: AvgPoolGradInputs,\n
  backend: MathBackendWebGL,\n  attrs: AvgPoolGradAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {dy, input} = inputs;\n  const x = input;\n  assertNotComplex([dy, input], 'avgPoolGrad');\n  const
{filterSize, strides, pad} = attrs;\n\n  const convInfo = backend_util.computePool2DInfo(\n    x.shape as [number,
  number, number, number], filterSize, strides,\n    1 /* dilations */, pad);\n  const avgPoolBackpropProgram = new
AvgPool2DBackpropProgram(convInfo);\n  return backend.runWebGLProgram(avgPoolBackpropProgram, [dy],
  x.dtype);\n}\n\nexport const avgPoolGradConfig: KernelConfig = {\n  kernelName: AvgPoolGrad,\n  backendName:
'webgl',\n  kernelFunc: avgPoolGrad as {} as KernelFunc\n};\n",/*\n * @license\n * Copyright
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport { BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc } from\n '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { batchMatMulImpl }\n from './BatchMatMul_impl';\nexport function batchMatMul(args: {\n inputs: BatchMatMulInputs,\n attrs:\n BatchMatMulAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b}\n = inputs;\n const {transposeA, transposeB} = attrs;\n\n return batchMatMulImpl({a, b, transposeA, transposeB,\n backend});\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'webgl',\n kernelFunc: batchMatMul as { } as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright\n 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */\n
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=====\n*\n\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { GPGPUProgram } from\n './gpgpu_math';\nexport class BatchNormProgram implements GPGPUProgram {\n variableNames: string[];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n xShape: number[], meanShape: number[],\n varianceShape: number[],\n offsetShape: number[]|null, scaleShape: number[]|null,\n varianceEpsilon:\n number) {\n this.variableNames = ['x', 'mean', 'variance'];\n backend_util.assertAndGetBroadcastShape(xShape,\n meanShape);\n backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n let offsetSnippet =\n '0.0';\n if (offsetShape != null) {\n backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n this.variableNames.push('offset');\n offsetSnippet = 'getOffsetAtOutCoords()';\n }\n\n let scaleSnippet =\n '1.0';\n if (scaleShape != null) {\n backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n this.variableNames.push('scale');\n scaleSnippet = 'getScaleAtOutCoords()';\n }\n\n this.outputShape =\n xShape;\n this.userCode = `\n void main() {\n float x = getXAtOutCoords();\n float mean =\n getMeanAtOutCoords();\n float variance = getVarianceAtOutCoords();\n float offset = ${offsetSnippet};\n\n float scale = ${scaleSnippet};\n float inv = scale * inversesqrt(variance + float(${varianceEpsilon}));\n setOutput(dot(vec3(x, -mean, offset), vec3(inv, inv, 1)));\n }\n`;\n}\n\n"/**\n * @license\n * Copyright\n 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n */\n
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=====\n*\n\nimport { backend_util } from '@tensorflow/tfjs-core';\nimport { GPGPUProgram } from\n './gpgpu_math';\nexport class BatchNormPackedProgram implements GPGPUProgram {\n variableNames:\n string[];\n outputShape: number[];\n userCode: string;\n packedInputs = true;\n packedOutput = true;\n\n constructor(\n xShape: number[], meanShape: number[], varianceShape: number[],\n offsetShape:\n number[]|null, scaleShape: number[]|null,\n varianceEpsilon: number) {\n this.variableNames = ['x', 'mean',\n 'variance'];\n backend_util.assertAndGetBroadcastShape(xShape, meanShape);\n backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n let offsetSnippet = 'vec4(0.0)';\n if
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(offsetShape != null) {\n    backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n    this.variableNames.push('offset');\n    offsetSnippet = 'getOffsetAtOutCoords()';\n    }\n\n    let scaleSnippet =\n    'vec4(1.0)';\n    if (scaleShape != null) {\n        backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n        this.variableNames.push('scale');\n        scaleSnippet = 'getScaleAtOutCoords()';\n    }\n\n    this.outputShape =\n    xShape;\n    this.userCode = `\n    void main() {\n        vec4 offset = ${offsetSnippet};\n        vec4 scale =\n        ${scaleSnippet};\n        vec4 x = getXAtOutCoords();\n        vec4 mean = getMeanAtOutCoords();\n        vec4\n        variance = getVarianceAtOutCoords();\n        vec4 inv = scale * inversesqrt(variance +\n        vec4(${varianceEpsilon}));\n        setOutput((x - mean) * inv + offset);\n    }\n    `;\n    }\n}\n\n", "\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable\n * law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport {env, FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,\nTensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BatchNormProgram} from '../batchnorm_gpu';\nimport {BatchNormPackedProgram} from\n '../batchnorm_packed_gpu';\n\nexport const batchNorm: (params: {\n  inputs: FusedBatchNormInputs,\n  backend: MathBackendWebGL,\n  attrs: FusedBatchNormAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n  const\n  {x, mean, variance, offset, scale} = inputs;\n\n  util.assert(\n    mean.shape.length === variance.shape.length,\n    () => 'Batch normalization gradient requires mean and variance to have '\n    +\n    'equal ranks.);\n  util.assert(\n    offset == null || mean.shape.length === offset.shape.length,\n    () => 'Batch normalization gradient requires mean\n    and offset to have '\n    +\n    'equal ranks.);\n  util.assert(\n    scale == null || mean.shape.length ===\n    scale.shape.length,\n    () => 'Batch normalization gradient requires mean and scale to have '\n    +\n    'equal\n    ranks.);\n\n  let {varianceEpsilon} = attrs;\n  if (varianceEpsilon == null) {\n    varianceEpsilon = 0.001;\n  }\n\n  const finalInputs = [x, mean, variance];\n\n  let offsetShape = null;\n  if (offset != null) {\n    offsetShape =\n    offset.shape;\n    finalInputs.push(offset);\n  }\n\n  let scaleShape = null;\n  if (scale != null) {\n    scaleShape =\n    scale.shape;\n    finalInputs.push(scale);\n  }\n\n  const program =\n  env().getBool('WEBGL_PACK_NORMALIZATION') ?\n  new BatchNormPackedProgram(\n    x.shape,\n    mean.shape, variance.shape, offsetShape, scaleShape,\n    varianceEpsilon) :\n  new BatchNormProgram(\n    x.shape, mean.shape, variance.shape, offsetShape, scaleShape,\n    varianceEpsilon);\n  const output =\n  backend.runWebGLProgram(program, finalInputs, finalInputs[0].dtype);\n\n  return output;\n};\n\nexport const\n  batchNormConfig: KernelConfig = {\n  kernelName: FusedBatchNorm,\n  backendName: 'webgl',\n  kernelFunc:\n  batchNorm as {\n  } as KernelFunc,\n};\n\n", "\n/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *\n *=====\n\n*/\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport\n  {getCoordsDataType} from './shader_compiler';\n\nexport class SliceProgram implements GPGPUProgram {\n  variableNames = ['source'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  // Caching uniform\n  location for speed.\n  startLoc: WebGLUniformLocation;\n\n  constructor(destSize: number[]) {\n    this.outputShape = destSize;\n    this.rank = destSize.length;\n\n    const dtype = getCoordsDataType(this.rank);\n    const uniformPart = `uniform int start[${this.rank}]`;\n    const sourceCoords = getCoords(this.rank);\n    let

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body: string;\n  const coordSum = destSize.map( (_, i) => {\n    return `sourceLoc.${coords[i]} = start[${i}] +
coords.${coords[i]}`;\n  });\n  body = `\n    ${dtype} sourceLoc;\n    ${dtype} coords =
getOutputCoords();\n    ${coordSum.join("\n")}\n  `;\n  this.userCode = `\n    ${uniformPart}\n  void
main() {\n    ${body}\n    setOutput(getSource(${sourceCoords}));\n  }\n  `;\n}\n\n
getCustomSetupFunc(start: number[]) {\n  if (start.length !== this.rank) {\n    throw Error(\n    `The rank
(${this.rank}) of the program must match the `+\n    `length of start (${start.length})`);\n  }\n  return (gpgpu:
GPGPUContext, webGLProgram: WebGLProgram) => {\n    if (this.startLoc == null) {\n      this.startLoc =
gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n    }\n    if (this.startLoc == null) {\n      // This means
the compiler has optimized and realized it doesn't need\n      // the uniform.\n      return;\n    }\n  }\n  gpgpu.gl.uniform1iv(this.startLoc, start);\n  };\n}\n\n\nconst coords = ['x', 'y', 'z', 'w', 'u', 'v'];\n\nfunction
getCoords(rank: number): string {\n  if (rank === 1) {\n    return 'sourceLoc';\n  } else if (rank <= 6) {\n    return
coords.slice(0, rank).map(x => 'sourceLoc.' + x).join(',');\n  } else {\n    throw Error(`Slicing for rank ${rank} is not
yet supported`);\n  }\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n */

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*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport
{getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class
SlicePackedProgram implements GPGPUProgram {\n  variableNames = ['source'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  // Caching uniform
location for speed.\n  startLoc: WebGLUniformLocation;\n\n  constructor(destSize: number[]) {\n
this.outputShape = destSize;\n  this.rank = destSize.length;\n\n  const dtype = getCoordsDataType(this.rank);\n
const coords = getChannels('coords', this.rank);\n  const sourceLoc = getChannels('sourceLoc', this.rank);\n\n
const innerDims =\n    this.rank === 1 ? 'sourceLoc' : `vec2(${sourceLoc.slice(-2).join()})`;\n  const getChannel
=\n    `getChannel(getSource(${sourceLoc.join()}), ${innerDims})`;\n  const upperRow = `\n    result.x =
${getChannel};\n    if (++${coords[this.rank - 1]} < ${destSize[this.rank - 1]}) {\n      ++${sourceLoc[this.rank -
1]};\n    }\n    result.y = ${getChannel};\n    --${sourceLoc[this.rank - 1]};\n  `;\n  const lowerRow =
this.rank === 1 ? `:\n    --${coords[this.rank - 1]};\n    if (++${coords[this.rank - 2]} < ${destSize[this.rank -
2]}) {\n      ++${sourceLoc[this.rank - 2]};\n    }\n    result.z = ${getChannel};\n    if (++${coords[this.rank - 1]} <
${destSize[this.rank - 1]}) {\n      ++${sourceLoc[this.rank - 1]};\n    }\n    result.w = ${getChannel};\n  }\n
`;\n\n  const sourceLocSetup = this.rank <= 4 ?\n    `sourceLoc = coords +\n
${dtype}(${destSize.map( (_, i) => `start[${i}]`).join()});`\n    :\n    `destSize.map( (_, i) => `${sourceLoc[i]} =
${coords[i]} + start[${i]}`);\n    `.\n    .join("\n");\n  this.userCode = `\n    uniform int start[${this.rank}];\n  void
main() {\n    ${dtype} coords = getOutputCoords();\n    ${dtype} sourceLoc;\n    ${sourceLocSetup}\n
vec4 result = vec4(0.);\n    ${upperRow}\n    ${lowerRow}\n    setOutput(result);\n  }\n  `;\n}\n\n
getCustomSetupFunc(start: number[]) {\n  if (start.length !== this.rank) {\n    throw Error(\n    `The rank
(${this.rank}) of the program must match the `+\n    `length of start (${start.length})`);\n  }\n  return (gpgpu:
GPGPUContext, webGLProgram: WebGLProgram) => {\n    if (this.startLoc == null) {\n      this.startLoc =
gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n    }\n    if (this.startLoc == null) {\n      // This means
the compiler has optimized and realized it doesn't need\n      // the uniform.\n      return;\n    }\n  }\n  gpgpu.gl.uniform1iv(this.startLoc, start);\n  };\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,

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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { reshape } from './Reshape';\nimport { slice } from './Slice';\nimport { transpose } from './Transpose';\n\nexport const batchToSpaceND = (args: {\n  inputs: BatchToSpaceNDInputs,\n  backend: MathBackendWebGL,\n  attrs: BatchToSpaceNDAttrs\n}): TensorInfo => {\n  const { inputs, backend, attrs } = args;\n  const { x } = inputs;\n  const { blockShape, crops } = attrs;\n  util.assert(\n    x.shape.length <= 4,\n    () => 'batchToSpaceND for rank > 4 with a WebGL backend not ' +\n      'implemented yet');\n  const prod = blockShape.reduce((a, b) => a * b);\n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted =\n    backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords =\n    backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize =\n    backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n  const toDispose = [];\n  const reshapedIntermediate =\n    reshape({ inputs: { x }, backend, attrs: { shape: reshaped } });\n  const transposedIntermediate = transpose(\n    { inputs: { x: reshapedIntermediate }, backend, attrs: { perm: permuted } });\n  const reshapedIntermediate2 = reshape({\n    inputs: { x: transposedIntermediate },\n    backend,\n    attrs: { shape: reshapedPermuted }\n  });\n  const sliced = slice({\n    inputs: { x: reshapedIntermediate2 },\n    backend,\n    attrs: { begin: sliceBeginCoords, size: sliceSize }\n  });\n  toDispose.push(reshapedIntermediate);\n  toDispose.push(transposedIntermediate);\n  toDispose.push(reshapedIntermediate2);\n  toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n  return sliced;\n};\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n  kernelName: BatchToSpaceND,\n  backendName: 'webgl',\n  kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n*\n\nimport { Bincount, BincountAttrs, BincountInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { bincountImplCPU } from './kernel_utils/shared';\n\nexport function bincount(args: {\n  inputs: BincountInputs,\n  backend: MathBackendWebGL,\n  attrs: BincountAttrs\n}): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { x, weights } = inputs;\n  const { size } = attrs;\n  const xVals = backend.readSync(x.dataId) as TypedArray;\n  const weightsVals = backend.readSync(weights.dataId) as TypedArray;\n  const outVals =\n    bincountImplCPU(xVals, weightsVals, weights.dtype, weights.shape, size);\n  return backend.makeTensorInfo([size], weights.dtype, outVals);\n}\n\nexport const bincountConfig: KernelConfig = {\n  kernelName: Bincount,\n  backendName: 'webgl',\n  kernelFunc: bincount as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```

*\n\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'./backend_webgl';\n\nimport {UnaryOpProgram} from './unaryop_gpu';\n\nconst TO_INT = `return
float(int(x));`\n\nexport function int(input: TensorInfo, backend: MathBackendWebGL): TensorInfo {\n const
program = new UnaryOpProgram(input.shape, TO_INT);\n const output = backend.runWebGLProgram(program,
[input], 'int32');\n return {dataId: output.dataId, shape: output.shape, dtype: output.dtype};\n}\n", "/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {GPGPUContext} from './gpgpu_context';\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport
class ClipProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape:
number[];\n\n // Caching uniform locations for speed.\n minLoc: WebGLUniformLocation;\n maxLoc:
WebGLUniformLocation;\n\n constructor(aShape: number[]) {\n this.outputShape = aShape;\n this.userCode =
`\n uniform float minVal;\n uniform float maxVal;\n\n void main() {\n float value =
getAAtOutCoords();\n if (isnan(value)) {\n setOutput(value);\n return;\n }\n\n
setOutput(clamp(value, minVal, maxVal));\n }\n `;\n }\n\n getCustomSetupFunc(min: number, max: number)
{\n return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n if (this.minLoc == null) {\n
this.minLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n this.maxLoc =
gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n }\n gpgpu.gl.uniform1f(this.minLoc,
min);\n gpgpu.gl.uniform1f(this.maxLoc, max);\n }; }\n}\n", "/**\n * @license\n * Copyright 2018 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {GPGPUContext} from './gpgpu_context';\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport
class ClipPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n packedInputs = true;\n
packedOutput = true;\n userCode: string;\n outputShape: number[];\n\n // Caching uniform locations for speed.\n
minLoc: WebGLUniformLocation;\n maxLoc: WebGLUniformLocation;\n\n constructor(aShape: number[]) {\n
this.outputShape = aShape;\n this.userCode = `\n uniform float minVal;\n uniform float maxVal;\n\n void
main() {\n vec4 value = getAAtOutCoords();\n\n if (any(isnan(value))) {\n setOutput(value);\n
return;\n }\n\n setOutput(clamp(value, vec4(minVal), vec4(maxVal)));\n }\n `;\n }\n\n
getCustomSetupFunc(min: number, max: number) {\n return (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) => {\n if (this.minLoc == null) {\n this.minLoc =
gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n this.maxLoc =
gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n }\n gpgpu.gl.uniform1f(this.minLoc,
min);\n gpgpu.gl.uniform1f(this.maxLoc, max);\n }; }\n}\n", "/**\n * @license\n * Copyright 2020 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, env, KernelConfig, KernelFunc, TensorInfo}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ClipProgram}
from '../clip_gpu';\nimport {ClipPackedProgram} from '../clip_packed_gpu';\n\nexport function clipByValue(args:
{\n  inputs: ClipByValueInputs,\n  backend: MathBackendWebGL,\n  attrs: ClipByValueAttrs\n}): TensorInfo {\n
const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n\n  let
program;\n  if (env().getBool('WEBGL_PACK_CLIP')) {\n    program = new ClipPackedProgram(x.shape);\n  }
else {\n    program = new ClipProgram(x.shape);\n  }\n  const customSetup =
program.getCustomSetupFunc(clipValueMin, clipValueMax);\n  return backend.runWebGLProgram(program, [x],
x.dtype, customSetup);\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n
backendName: 'webgl',\n  kernelFunc: clipByValue as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright
2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ComplexAbsProgram implements
GPGPUProgram {\n  variableNames = ['real', 'imag'];\n  userCode: string;\n  outputShape: number[];\n\n  constructor(shape: number[]) {\n    this.outputShape = shape;\n    this.userCode = `
void main() {\n  float re
= abs(getRealAtOutCoords());\n  float im = abs(getImagAtOutCoords());\n  float mx = max(re, im);\n
// sadly the length function in glsl is not underflow-safe\n  // (at least not on Intel GPUs). So the safe solution
is\n  // to ensure underflow-safety in all cases.\n  setOutput(\n    mx == 0.0 ? 0.0 : mx * length(vec2(1,
min(re, im)/mx))\n  );\n  }\n  `;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {ComplexAbs, ComplexAbsInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ComplexAbsProgram} from
'../complex_abs_gpu';\n\n// Returns a TensorInfo with the complex shape and the dataId of the\n// underlying part.
We need to do this because a reshaped complex tensor is\n// not reflected in its parts.\nfunction
makeComplexComponentTensorInfo(\n  complexTensor: TensorInfo, complexPart: TensorInfo): TensorInfo {\n
return {\n  dataId: complexPart.dataId,\n  dtype: complexPart.dtype,\n  shape: complexTensor.shape\n
};\n}\n\nexport function complexAbs(\n  args: {inputs: ComplexAbsInputs, backend: MathBackendWebGL}):
TensorInfo {\n  const {inputs, backend} = args;\n  const {x} = inputs;\n\n  const xData =
backend.texData.get(x.dataId);\n\n  const program = new ComplexAbsProgram(x.shape);\n  const programInputs =
[\n    makeComplexComponentTensorInfo(x, xData.complexTensorInfos.real),\n
makeComplexComponentTensorInfo(x, xData.complexTensorInfos.imag),\n  ];\n\n  return
backend.runWebGLProgram(\n    program, programInputs, programInputs[0].dtype);\n}\n\nexport const
complexAbsConfig: KernelConfig = {\n  kernelName: ComplexAbs,\n  backendName: 'webgl',\n  kernelFunc:
complexAbs as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n
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compliance with the License.\n * You may obtain a copy of the License at\n *

```

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```
=====  
*  
\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from  
'./gpgpu_math';\nexport class ConcatProgram implements GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n  // Concat 2d tensors along axis=1. See comments in  
MathBackendWebGL.concat().\n  constructor(shapes: Array<number, number>) {\n    this.outputShape =  
backend_util.computeOutShape(shapes, 1 /* axis */);\n    this.variableNames = shapes.map((_, i) => `T${i}`);\n\n    const offsets: number[] = new Array(shapes.length - 1);\n    offsets[0] = shapes[0][1];\n    for (let i = 1; i <  
offsets.length; i++) {\n      offsets[i] = offsets[i - 1] + shapes[i][1];\n    }\n\n    const snippets = ['if (yC <  
${offsets[0]}) setOutput(getT0(yR, yC));'];\n    for (let i = 1; i < offsets.length; i++) {\n      const shift = offsets[i -  
1];\n      snippets.push(\n        `else if (yC < ${offsets[i]})` +\n        `setOutput(getT${i}(yR, yC-${shift}));`);\n    }\n\n    const lastIndex = offsets.length;\n    const lastShift = offsets[offsets.length - 1];\n    snippets.push(`else  
setOutput(getT${lastIndex}(yR, yC-${lastShift}));`);\n\n    this.userCode = `\n    void main() {\n      ivec2 coords  
= getOutputCoords();\n      int yR = coords.x;\n      int yC = coords.y;\n      ${snippets.join('\n    ')}\n    }\n  `;\n}\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the  
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the  
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed  
on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or  
implied.\n * See the License for the specific language governing permissions and\n * limitations under the  
License.\n */
```

```
=====  
*  
\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from  
'./gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from  
'./shader_compiler';\nexport class ConcatPackedProgram implements GPGPUProgram {\n  variableNames:  
string[];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[] = [];\n  userCode: string;\n  constructor(shapes: number[][], axis: number) {\n    this.outputShape = backend_util.computeOutShape(shapes,  
axis);\n    const shape = this.outputShape;\n    const rank = shape.length;\n    const dtype =  
getCoordsDataType(rank);\n    const coords = getChannels('coords', rank);\n    const channels = ['x', 'y', 'z', 'w', 'u',  
'v'].slice(0, rank);\n    this.variableNames = shapes.map((_, i) => `T${i}`);\n\n    const offsets: number[] = new  
Array(shapes.length - 1);\n    offsets[0] = shapes[0][axis];\n    for (let i = 1; i < offsets.length; i++) {\n      offsets[i] =  
offsets[i - 1] + shapes[i][axis];\n    }\n\n    const channel = channels[axis];\n    const lastChannels = channels.slice(-  
2);\n    const allChannels = channels.join();\n\n    let getValueSnippet = `if (${channel} < ${offsets[0]}) {\n    return getChannel(\n      getT0(${allChannels}), vec2(${lastChannels.join()}));\n    }`;\n    for (let i = 1; i <  
offsets.length; i++) {\n      const shift = offsets[i - 1];\n      // Note: the >= comparison below may seem unnecessary  
given the check\n      // above but is needed to workaround branch execution issues on some\n      // devices. It makes  
all the conditions exclusive without relying on\n      // execution order.\n      getValueSnippet += `\n    if  
(${channel} < ${offsets[i]} && ${channel} >= ${offsets[i - 1]}) {\n      return getChannel(\n        getT${i}(${shiftedChannels(channels, channel, shift)}),\n        vec2(${shiftedChannels(lastChannels, channel,  
shift)}));\n    }`;\n    }\n\n    const lastIndex = offsets.length;\n    const shift = offsets[offsets.length - 1];\n    getValueSnippet += `\n    return getChannel(\n      getT${lastIndex}(${shiftedChannels(channels, channel,  
shift)}),\n      vec2(${shiftedChannels(lastChannels, channel, shift)}));`;\n\n    this.userCode = `\n    float  
getValue(${channels.map(x => 'int ' + x)}) {\n      ${getValueSnippet}\n    }\n\n    void main() {\n      ${dtype}  
coords = getOutputCoords();\n      vec4 result = vec4(getValue(${coords}), 0., 0., 0.);  
      ${coords[rank - 1]}  
= ${coords[rank - 1]} + 1;\n      if (${coords[rank - 1]} < ${shape[rank - 1]}) {\n        result.g =
```

```

getValue(${coords});\n    }\n    ${coords[rank - 2]} = ${coords[rank - 2]} + 1;\n    if (${coords[rank - 2]}
< ${shape[rank - 2]}) {\n        result.a = getValue(${coords});\n    }\n    ${coords[rank - 1]} =
${coords[rank - 1]} - 1;\n    if (${coords[rank - 2]} < ${shape[rank - 2]} &&\n        ${coords[rank - 1]} <
${shape[rank - 1]}) {\n        result.b = getValue(${coords});\n    }\n    setOutput(result);\n    }\n`;
}\n\n/**\n * Return an expression for coordinates into a vector where a given channel\n * will be offset by
[shift].\n *\n * @param channels the channels to consider\n * @param channel the channel we want shifted\n *
@param shift the amount to subtract from the channel.\n *\n * @returns a string of the form 'x, y-[shift], z' where
any one channel can\n * have the shift applied.\n */\nfunction shiftedChannels(channels: string[], channel: string,
shift: number) {\n    const channelId = channels.indexOf(channel);\n    const res = channels.map((c, idx) => {\n        if
(idx === channelId) {\n            return `${c} - ${shift}`;\n        } else {\n            return c;\n        }\n    });\n    return
res.join();\n}\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport {Imag, ImagInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {identity} from './Identity';\n\nexport function imag(args:
{inputs: ImagInputs, backend: MathBackendWebGL});\n    TensorInfo {\n        const {inputs, backend} = args;\n        const
{input} = inputs;\n        const inputData = backend.texData.get(input.dataId);\n\n        return identity({inputs: {x:
inputData.complexTensorInfos.imag}, backend});\n    }\n\nexport const imagConfig: KernelConfig = {\n    kernelName: Imag,\n    backendName: 'webgl',\n    kernelFunc: imag as {} as KernelFunc\n};\n\n",/**\n * @license\n *
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {concatImpl} from
'./Concat_impl';\n\nimport {identity} from './Identity';\n\nexport function concat(\n    args:\n        {inputs:
ConcatInputs, attrs: ConcatAttrs, backend: MathBackendWebGL});\n    TensorInfo {\n        const {inputs, backend,
attrs} = args;\n        const {axis} = attrs;\n\n        const $axis = util.parseAxisParam(axis, inputs[0].shape)[0];\n        const
outShape =\n            backend_util.computeOutShape(inputs.map(t => t.shape), $axis);\n\n        if
(util.sizeFromShape(outShape) === 0) {\n            return backend.makeTensorInfo(outShape, inputs[0].dtype, []);\n        }\n\n        // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n        const $inputs = inputs.filter(t =>
util.sizeFromShape(t.shape) > 0);\n        if ($inputs.length === 1) {\n            return identity({inputs: {x: $inputs[0]},
backend});\n        }\n\n        const shapes = $inputs.map(t => t.shape);\n        backend_util.assertParamsConsistent(shapes,
$axis);\n\n        return concatImpl($inputs, $axis, backend);\n    }\n\nexport const concatConfig: KernelConfig = {\n    kernelName: Concat,\n    backendName: 'webgl',\n    kernelFunc: concat as {} as KernelFunc\n};\n\n",/**\n *
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```
=====
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class Conv2DProgram implements GPGPUProgram {\n  variableNames = ['x', 'W'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv2DInfo, addBias =
false,\n    activation: string = null, hasPreluActivationWeights = false,\n    hasLeakyreluAlpha = false) {\n    this.outputShape = convInfo.outShape;\n    const padTop = convInfo.padInfo.top;\n    const padLeft =
convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth =
convInfo.dilationWidth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n\n    const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4) * 4;\n    const
inputDepthVec4Remainder = convInfo.inChannels % 4;\n    const isChannelsLast = convInfo.dataFormat ===
'channelsLast';\n\n    const rowDim = isChannelsLast ? 1 : 2;\n    const colDim = isChannelsLast ? 2 : 3;\n    const
channelDim = isChannelsLast ? 3 : 1;\n\n    let activationSnippet = ", applyActivationSnippet = ";\n    if (activation)
{\n      if (hasPreluActivationWeights) {\n        activationSnippet = `float activation(float a) {\n          float b =
getPreluActivationWeightsAtOutCoords();\n          ${activation}\n        }`; \n      } else if (hasLeakyreluAlpha) {\n
activationSnippet = `float activation(float a) {\n          float b = getLeakyreluAlphaAtOutCoords();\n
${activation}\n        }`; \n      } else {\n        activationSnippet = `\n          float activation(float x) {\n
${activation}\n        }\n        `;\n      }\n\n      applyActivationSnippet = `result = activation(result);`;\n    }\n\n    const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : ";\n    if (addBias) {\n
this.variableNames.push('bias');\n    }\n\n    if (hasPreluActivationWeights) {\n
this.variableNames.push('preluActivationWeights');\n    }\n\n    if (hasLeakyreluAlpha) {\n
this.variableNames.push('leakyreluAlpha');\n    }\n\n    this.userCode = `\n      ${activationSnippet}\n\n      const
ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n      const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int batch = coords[0];\n        int d2 =
coords[${channelDim}];\n\n        ivec2 xRCCorner =\n          ivec2(coords[${rowDim}], coords[${colDim}]) *
strides - pads;\n        int xRCorner = xRCCorner.x;\n        int xCCorner = xRCCorner.y;\n\n        // Convolve x(?, ?,
d1) with w(:, :, d1, d2) to get y(yR, yC, d2).\n        // ? = to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n        for (int wR = 0; wR < ${filterHeight}; wR++) {\n          int xR = xRCorner + wR *
${dilationHeight};\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n          }\n\n          for
(int wC = 0; wC < ${filterWidth}; wC++) {\n            int xC = xCCorner + wC * ${dilationWidth};\n            if (xC
< 0 || xC >= ${convInfo.inWidth}) {\n              continue;\n            }\n\n            for (int d1 = 0; d1 <
${inputDepthNearestVec4}; d1 += 4) {\n              vec4 wValues = vec4(\n                getW(wR, wC, d1, d2),\n
getW(wR, wC, d1 + 1, d2),\n                getW(wR, wC, d1 + 2, d2),\n                getW(wR, wC, d1 + 3, d2)\n
);\n\n              if (${isChannelsLast}) {\n                vec4 xValues = vec4(\n                  getX(batch, xR, xC, d1),\n
getX(batch, xR, xC, d1 + 1),\n                  getX(batch, xR, xC, d1 + 2),\n                  getX(batch, xR, xC, d1 +
3)\n                );\n                dotProd += dot(xValues, wValues);\n              } else {\n                vec4 xValues =
vec4(\n                  getX(batch, d1, xR, xC),\n                  getX(batch, d1 + 1, xR, xC),\n                  getX(batch, d1 +
2, xR, xC),\n                  getX(batch, d1 + 3, xR, xC)\n                );\n                dotProd += dot(xValues, wValues);\n
              }\n\n              if (${inputDepthVec4Remainder} === 1) {\n                if (${isChannelsLast}) {\n
dotProd +=\n                  getX(batch, xR, xC, ${inputDepthNearestVec4}) * \n                  getW(wR, wC,
${inputDepthNearestVec4}, d2);\n                } else {\n                  dotProd +=\n                  getX(batch,
${inputDepthNearestVec4}, xR, xC) * \n                  getW(wR, wC, ${inputDepthNearestVec4}, d2);\n                }\n
              } else if (${inputDepthVec4Remainder} === 2) {\n                vec2 wValues = vec2(\n                  getW(wR, wC, ${inputDepthNearestVec4}, d2),\n
getW(wR, wC, ${inputDepthNearestVec4} + 1, d2)\n                );\n                if (${isChannelsLast}) {\n
vec2 xValues = vec2(\n                  getX(batch, xR, xC,
${inputDepthNearestVec4}),\n                  getX(batch, xR, xC, ${inputDepthNearestVec4} + 1)\n                );\n
dotProd += dot(xValues, wValues);\n                } else {\n                  vec2 xValues = vec2(\n                  getX(batch,
```

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    ${inputDepthNearestVec4}, xR, xC),\n        getX(batch, ${inputDepthNearestVec4} + 1, xR, xC)\n
    );\n        dotProd += dot(xValues, wValues);\n        }\n        } else if (${inputDepthVec4Remainder ===\n
    3}) {\n        vec3 wValues = vec3(\n        getW(wR, wC, ${inputDepthNearestVec4}, d2),\n
    getW(wR, wC, ${inputDepthNearestVec4} + 1, d2),\n        getW(wR, wC, ${inputDepthNearestVec4} + 2,\n
    d2)\n        );\n        if (${isChannelsLast}) {\n        vec3 xValues = vec3(\n        getX(batch, xR,\n
    xC, ${inputDepthNearestVec4}),\n        getX(batch, xR, xC, ${inputDepthNearestVec4} + 1),\n
    getX(batch, xR, xC, ${inputDepthNearestVec4} + 2)\n        );\n        dotProd += dot(xValues, wValues);\n
    }\n        } else {\n        vec3 xValues = vec3(\n        getX(batch, ${inputDepthNearestVec4}, xR, xC),\n
    getX(batch, ${inputDepthNearestVec4} + 1, xR, xC),\n        getX(batch, ${inputDepthNearestVec4} +\n
    2, xR, xC)\n        );\n        dotProd += dot(xValues, wValues);\n        }\n        }\n        }\n        }\n
    }\n    }\n    float result = dotProd;\n    ${addBiasSnippet}\n    ${applyActivationSnippet}\n
    setOutput(result);\n    }\n    `;\n    }\n}\n\nexport class Conv3DProgram implements GPGPUProgram {\n
    variableNames = ['x', 'W'];\n    outputShape: number[];\n    userCode: string;\n\n    constructor(convInfo:\n
    backend_util.Conv3DInfo) {\n        this.outputShape = convInfo.outShape;\n        const padFront =\n
    convInfo.padInfo.front;\n        const padTop = convInfo.padInfo.top;\n        const padLeft = convInfo.padInfo.left;\n
    const strideDepth = convInfo.strideDepth;\n        const strideHeight = convInfo.strideHeight;\n        const strideWidth =\n
    convInfo.strideWidth;\n        const dilationDepth = convInfo.dilationDepth;\n        const dilationHeight =\n
    convInfo.dilationHeight;\n        const dilationWidth = convInfo.dilationWidth;\n        const filterDepth =\n
    convInfo.filterDepth;\n        const filterHeight = convInfo.filterHeight;\n        const filterWidth =\n
    convInfo.filterWidth;\n\n        const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4) * 4;\n        const\n
    inputDepthVec4Remainder = convInfo.inChannels % 4;\n\n        this.userCode = `\n        const ivec3 strides =\n
    ivec3(${strideDepth}, ${strideHeight}, ${\n        strideWidth});\n        const ivec3 pads = ivec3(${padFront},\n
    ${padTop}, ${padLeft});\n\n        void main() {\n            ivec5 coords = getOutputCoords();\n            int batch =\n
    coords.x;\n            int d2 = coords.u;\n\n            ivec3 xFRCCorner = ivec3(coords.y, coords.z, coords.w) * strides -\n
    pads;\n            int xFCorner = xFRCCorner.x;\n            int xRCorner = xFRCCorner.y;\n            int xCCorner =\n
    xFRCCorner.z;\n\n            // Convolve x(?, ?, ?, d1) with w(:, :, :, d1, d2) to get\n            // y(yF, yR, yC, d2). ? = to be\n
    determined. := across all\n            // values in that axis.\n            float dotProd = 0.0;\n            for (int wF = 0; wF <\n
    ${filterDepth}; wF++) {\n                int xF = xFCorner + wF * ${dilationDepth};\n                if (xF < 0 || xF >=\n
    ${convInfo.inDepth}) {\n                    continue;\n                }\n\n                for (int wR = 0; wR < ${filterHeight}; wR++) {\n\n
    int xR = xRCorner + wR * ${dilationHeight};\n                    if (xR < 0 || xR >= ${convInfo.inHeight}) {\n\n
    continue;\n                    }\n\n                    for (int wC = 0; wC < ${filterWidth}; wC++) {\n                        int xC = xCCorner + wC *\n
    ${dilationWidth};\n                        if (xC < 0 || xC >= ${convInfo.inWidth}) {\n                            continue;\n
    }\n\n                        for (int d1 = 0; d1 < ${inputDepthNearestVec4}; d1 += 4) {\n                            vec4 xValues = vec4(\n
    getX(batch, xF, xR, xC, d1),\n                            getX(batch, xF, xR, xC, d1 + 1),\n                            getX(batch, xF, xR, xC, d1 +\n
    2),\n                            getX(batch, xF, xR, xC, d1 + 3)\n                            );\n                            vec4 wValues = vec4(\n
    getW(wF, wR, wC, d1, d2),\n                            getW(wF, wR, wC, d1 + 1, d2),\n                            getW(wF, wR, wC, d1 + 2,\n
    d2),\n                            getW(wF, wR, wC, d1 + 3, d2)\n                            );\n                            dotProd += dot(xValues, wValues);\n
    }\n                            if (${inputDepthVec4Remainder === 1}) {\n                                dotProd +=\n                                getX(batch, xF,\n
    xR, xC, ${inputDepthNearestVec4}) *\n                                getW(wF, wR, wC, ${inputDepthNearestVec4}, d2);\n
    }\n                            } else if (${inputDepthVec4Remainder === 2}) {\n                                vec2 xValues = vec2(\n
    getX(batch, xF, xR,\n
    xC, ${inputDepthNearestVec4}),\n                                getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 1)\n
    );\n                                vec2 wValues = vec2(\n                                getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n
    getW(wF, wR, wC, ${inputDepthNearestVec4} + 1, d2)\n                                );\n                                dotProd += dot(xValues,\n
    wValues);\n                            } else if (${inputDepthVec4Remainder === 3}) {\n                                vec3 xValues = vec3(\n
    getX(batch, xF, xR, xC, ${inputDepthNearestVec4}),\n                                getX(batch, xF, xR, xC,\n
    ${inputDepthNearestVec4} + 1),\n                                getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 2)\n
    );\n                                vec3 wValues = vec3(\n                                getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n
    getW(wF, wR, wC, ${inputDepthNearestVec4} + 1, d2),\n                                getW(wF, wR, wC,\n
    `;\n
    }

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    ${inputDepthNearestVec4} + 2, d2)\n          );\n          dotProd += dot(xValues, wValues);\n          }\n    }\n  }\n  setOutput(dotProd);\n  }\n  `;\n  }\n}\n", "/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {getGslIDifferences} from
'/gsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Im2ColPackedProgram
implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    outputShape: number[], inputShape: number[],\n    convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = outputShape;\n\n    const {\n      filterWidth,\n      inChannels,\n      strideWidth,\n      strideHeight,\n      padInfo,\n      outWidth,\n      dilationWidth,\n      dilationHeight,\n      dataFormat\n    } = convInfo;\n    const {left, top} = padInfo;\n    const itemsPerBlockRow =
inChannels * filterWidth;\n    const gsl = getGslIDifferences();\n    const isChannelsLast = dataFormat ===
'channelsLast';\n    const rowDim = isChannelsLast ? 0 : 1;\n    const colDim = isChannelsLast ? 1 : 2;\n\n    let
unrolled = `;\n\n    for (let row = 0; row <= 1; row++) {\n      for (let col = 0; col <= 1; col++) {\n        unrolled +=
`\n        blockIndex = rc.y + ${col};\n        pos = rc.x + ${row};\n        if(blockIndex < ${outputShape[1]} &&
pos < ${outputShape[0]}) {\n          offsetY = int(blockIndex / (${outWidth})) * ${strideHeight} - ${\n
top};\n          d0 = offsetY + ${dilationHeight} * (pos / ${itemsPerBlockRow});\n          if(d0 <
${inputShape[rowDim]} && d0 >= 0) {\n            offsetX = int(mod(float(blockIndex), ${outWidth}.) * ${\n
strideWidth}. - ${left}.);\n            d1 = offsetX + ${dilationWidth} * (int(mod(float(pos), ${\n
itemsPerBlockRow}.) / ${inChannels}.));\n            if(d1 < ${inputShape[colDim]} && d1 >= 0) {\n\n
ch = int(mod(float(pos), ${inChannels}.));\n            if (${isChannelsLast}) {\n              innerDims = vec2(d1,
ch);\n              result[${row} * 2 + col] = getChannel(\n                getA(d0, int(innerDims.x),\n
int(innerDims.y)), innerDims);\n            } else {\n              innerDims = vec2(d0, d1);\n              result[${row}
* 2 + col] = getChannel(\n                getA(ch, int(innerDims.x),\n                  int(innerDims.y)), innerDims);\n
            }\n          }\n        }\n      }\n    }\n\n    this.userCode = `\n    void main() {\n      ivec2
rc = getOutputCoords();\n      vec4 result = vec4(0);\n      int blockIndex, pos, offsetY, d0, offsetX, d1, ch;\n
      vec2 innerDims;\n      ${unrolled}\n      ${gsl.output} = result;\n    }\n  `;\n  }\n}\n", "/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from './backend_webgl';\nimport {Im2ColPackedProgram} from './im2col_packed_gpu';\nimport
{mapActivationToShaderProgram} from './kernel_utils/kernel_funcs_utils';\nimport {MatMulPackedProgram}
from './mulmat_packed_gpu';\nimport * as webgl_util from './webgl_util';\nimport {batchMatMulImpl,
MATMUL_SHARED_DIM_THRESHOLD} from './BatchMatMul_impl';\nimport {identity} from
 './Identity';\nimport {reshape} from './Reshape';\n\ntype Conv2DConfig = {\n  x: TensorInfo,\n  filter: TensorInfo,\n
convInfo: backend_util.Conv2DInfo,\n  backend: MathBackendWebGL,\n  bias?: TensorInfo,\n
preluActivationWeights?: TensorInfo,\n  leakyreluAlpha?: number,\n  activation?: backend_util.Activation\n};\n\n//
For 1x1 kernels that iterate through every point in the input, convolution\n// can be expressed as matrix

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multiplication (without need for memory\n// remapping).\nexport function conv2dByMatMul({\n  x,\n  filter,\n  convInfo,\n  backend,\n  bias = null,\n  preluActivationWeights = null,\n  leakyreluAlpha = 0,\n  activation =\n  null\n}: Conv2DConfig) {\n  // Reshapes conv2D input to 2D tensors, uses matMul and then reshape the\n  // result from 2D to 4D.\n  const xShape = x.shape;\n  const xTexData = backend.texData.get(x.dataId);\n  const\n  sharedMatMulDim = convInfo.inChannels;\n  const outerShapeX = xShape[0] * xShape[1] * xShape[2];\n  const\n  outerShapeFilter = convInfo.outChannels;\n  const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n  const transposeA = false;\n  const transposeB = false;\n\n  let out: TensorInfo;\n  const intermediates: TensorInfo[] =\n  [];\n\n  // TODO: Once reduction ops are packed, batchMatMul will always be packed\n  // and we can remove this\n  condition.\n  const batchMatMulWillBeUnpacked =\n    (outerShapeX === 1 || outerShapeFilter === 1) &&\n    sharedMatMulDim > MATMUL_SHARED_DIM_THRESHOLD;\n  const reshapeWillBeExpensive = xShape[2]\n  % 2 !== 0 && !xTexData.isPacked;\n\n  if (batchMatMulWillBeUnpacked ||\n    !env().getBool('WEBGL_LAZILY_UNPACK') ||\n    !env().getBool('WEBGL_PACK_BINARY_OPERATIONS')\n    ||\n    !reshapeWillBeExpensive) {\n    const targetShape = isChannelsLast ? xShape[0] * xShape[1] * xShape[2] :\n    xShape[0] * xShape[2] * xShape[3];\n    const xReshaped = reshape({\n      inputs: {x},\n      backend,\n      attrs: {shape: [1, targetShape, convInfo.inChannels]}\n    });\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n      backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n    const result = batchMatMulImpl({\n      a: xReshaped,\n      b: filterReshaped,\n      transposeA,\n      transposeB,\n      backend,\n      bias,\n      activation,\n      preluActivationWeights,\n      leakyreluAlpha\n    });\n    out =\n    reshape(\n      {inputs: {x: result}, backend, attrs: {shape: convInfo.outShape}});\n    intermediates.push(xReshaped);\n    intermediates.push(filterReshaped);\n    intermediates.push(result);\n  } else {\n    // Following optimization is specific to packed |x| with odd row count\n    // (For example, in channelLast mode,\n    'row count' refers to x.shape[2]):\n    // we avoid expensive packed 2x2 reshape by padding row count to next,\n    // even number. When x.shape[2] is odd, the result of packed batchMatMul is\n    // the same (has the same texture\n    layout and and values in the texture) as\n    // it is for even x.shape[2] + 1. We make the odd-rows tensor to look\n    like\n    // even-rows tensor before the operation and, after the batchMatMul,\n    // fix the even-rows result to have\n    odd number of rows.\n    const targetShape = isChannelsLast ?\n      xShape[0] * xShape[1] * (xShape[2] + 1) :\n      xShape[0] * xShape[2] * (xShape[3] + 1);\n    const xReshaped: TensorInfo = {\n      dataId: x.dataId,\n      shape:\n      [1, targetShape, convInfo.inChannels],\n      dtype: x.dtype\n    }; \n    // xTexData.shape gets referenced from\n    GPGPUBinary.inShapeInfos.\n    // Decrementing row count, after batchMatMul->...->compileProgram leads to\n    // invalid row count within the reference in GPGPUBinary.inShapeInfos.\n    // Alternative fix would be to provide a\n    copy to GPGPUBinary.inShapeInfos\n    // in compileProgram method, but that would affect compilation of all\n    // programs - instead, provide a copy here, with even row count, before\n    // calling batchMatMul->...-\n    >compileProgram and after that, the original\n    // xTexData.shape is restored.\n    const originalXTexDataShape =\n    xTexData.shape;\n    xTexData.shape = xTexData.shape.slice();\n    xTexData.shape[xTexData.shape.length -\n    2]++; \n    util.assert(\n      webgl_util.isReshapeFree(xTexData.shape, xReshaped.shape),\n      () => `packed\n    reshape ${xTexData.shape} to ${\n      xReshaped.shape} isn't free`);\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n      backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n    intermediates.push(filterReshaped);\n    const pointwiseConv = batchMatMulImpl({\n      a: xReshaped,\n      b:\n      filterReshaped,\n      backend,\n      transposeA,\n      transposeB,\n      bias,\n      activation,\n      preluActivationWeights,\n      leakyreluAlpha\n    });\n    const pointwiseConvTexData =\n    backend.texData.get(pointwiseConv.dataId);\n    util.assert(\n      pointwiseConvTexData.isPacked,\n      () =>\n      'batchMatMul result is expected to be packed');\n    // Restore the input shape to original.\n    xTexData.shape =\n    originalXTexDataShape;\n    // Set the output shape - there is no need for expensive reshape as data\n    // layout is\n    already correct.\n    pointwiseConvTexData.shape = convInfo.outShape;\n\n    out = identity({inputs: {x:\n    pointwiseConv}, backend});\n    out.shape = convInfo.outShape;\n\n    intermediates.push(pointwiseConv);\n  } \n\n  for (const i of intermediates) {\n    backend.disposeIntermediateTensorInfo(i);\n  }\n\n  return out;\n}\n\n//\n  Implements the im2row algorithm as outlined in "High Performance\n  // Convolutional Neural Networks for\n  Document Processing" (Suvisoft, 2006)\n  export function conv2dWithIm2Row({\n    x,\n    filter,\n    convInfo,\n    backend,\n    bias = null,\n    preluActivationWeights = null,\n    leakyreluAlpha = 0,\n    activation =\n    null\n}: Conv2DConfig) {\n  // Reshapes conv2D input to 2D tensors, uses matMul and then reshape the\n  // result from 2D to 4D.\n  const xShape = x.shape;\n  const xTexData = backend.texData.get(x.dataId);\n  const\n  sharedMatMulDim = convInfo.inChannels;\n  const outerShapeX = xShape[0] * xShape[1] * xShape[2];\n  const\n  outerShapeFilter = convInfo.outChannels;\n  const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n  const transposeA = false;\n  const transposeB = false;\n\n  let out: TensorInfo;\n  const intermediates: TensorInfo[] =\n  [];\n\n  // TODO: Once reduction ops are packed, batchMatMul will always be packed\n  // and we can remove this\n  condition.\n  const batchMatMulWillBeUnpacked =\n    (outerShapeX === 1 || outerShapeFilter === 1) &&\n    sharedMatMulDim > MATMUL_SHARED_DIM_THRESHOLD;\n  const reshapeWillBeExpensive = xShape[2]\n  % 2 !== 0 && !xTexData.isPacked;\n\n  if (batchMatMulWillBeUnpacked ||\n    !env().getBool('WEBGL_LAZILY_UNPACK') ||\n    !env().getBool('WEBGL_PACK_BINARY_OPERATIONS')\n    ||\n    !reshapeWillBeExpensive) {\n    const targetShape = isChannelsLast ? xShape[0] * xShape[1] * xShape[2] :\n    xShape[0] * xShape[2] * xShape[3];\n    const xReshaped = reshape({\n      inputs: {x},\n      backend,\n      attrs: {shape: [1, targetShape, convInfo.inChannels]}\n    });\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n      backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n    const result = batchMatMulImpl({\n      a: xReshaped,\n      b: filterReshaped,\n      transposeA,\n      transposeB,\n      backend,\n      bias,\n      activation,\n      preluActivationWeights,\n      leakyreluAlpha\n    });\n    out =\n    reshape(\n      {inputs: {x: result}, backend, attrs: {shape: convInfo.outShape}});\n    intermediates.push(xReshaped);\n    intermediates.push(filterReshaped);\n    intermediates.push(result);\n  } else {\n    // Following optimization is specific to packed |x| with odd row count\n    // (For example, in channelLast mode,\n    'row count' refers to x.shape[2]):\n    // we avoid expensive packed 2x2 reshape by padding row count to next,\n    // even number. When x.shape[2] is odd, the result of packed batchMatMul is\n    // the same (has the same texture\n    layout and and values in the texture) as\n    // it is for even x.shape[2] + 1. We make the odd-rows tensor to look\n    like\n    // even-rows tensor before the operation and, after the batchMatMul,\n    // fix the even-rows result to have\n    odd number of rows.\n    const targetShape = isChannelsLast ?\n      xShape[0] * xShape[1] * (xShape[2] + 1) :\n      xShape[0] * xShape[2] * (xShape[3] + 1);\n    const xReshaped: TensorInfo = {\n      dataId: x.dataId,\n      shape:\n      [1, targetShape, convInfo.inChannels],\n      dtype: x.dtype\n    }; \n    // xTexData.shape gets referenced from\n    GPGPUBinary.inShapeInfos.\n    // Decrementing row count, after batchMatMul->...->compileProgram leads to\n    // invalid row count within the reference in GPGPUBinary.inShapeInfos.\n    // Alternative fix would be to provide a\n    copy to GPGPUBinary.inShapeInfos\n    // in compileProgram method, but that would affect compilation of all\n    // programs - instead, provide a copy here, with even row count, before\n    // calling batchMatMul->...-\n    >compileProgram and after that, the original\n    // xTexData.shape is restored.\n    const originalXTexDataShape =\n    xTexData.shape;\n    xTexData.shape = xTexData.shape.slice();\n    xTexData.shape[xTexData.shape.length -\n    2]++; \n    util.assert(\n      webgl_util.isReshapeFree(xTexData.shape, xReshaped.shape),\n      () => `packed\n    reshape ${xTexData.shape} to ${\n      xReshaped.shape} isn't free`);\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n      backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n    intermediates.push(filterReshaped);\n    const pointwiseConv = batchMatMulImpl({\n      a: xReshaped,\n      b:\n      filterReshaped,\n      backend,\n      transposeA,\n      transposeB,\n      bias,\n      activation,\n      preluActivationWeights,\n      leakyreluAlpha\n    });\n    const pointwiseConvTexData =\n    backend.texData.get(pointwiseConv.dataId);\n    util.assert(\n      pointwiseConvTexData.isPacked,\n      () =>\n      'batchMatMul result is expected to be packed');\n    // Restore the input shape to original.\n    xTexData.shape =\n    originalXTexDataShape;\n    // Set the output shape - there is no need for expensive reshape as data\n    // layout is\n    already correct.\n    pointwiseConvTexData.shape = convInfo.outShape;\n\n    out = identity({inputs: {x:\n    pointwiseConv}, backend});\n    out.shape = convInfo.outShape;\n\n    intermediates.push(pointwiseConv);\n  } \n\n  for (const i of intermediates) {\n    backend.disposeIntermediateTensorInfo(i);\n  }\n\n  return out;\n}\n

```

```

backend,\n bias = null,\n preluActivationWeights = null,\n leakyreluAlpha = 0,\n activation = null\n):
Conv2DConfig) {\n // Rearranges conv2d input so each block to be convolved over forms the\n // column of a new
matrix with shape [filterWidth * filterHeight * \n // inChannels, outHeight * outWidth]. The filter is also rearranged
so each\n // output channel forms a row of a new matrix with shape [outChannels,\n // filterWidth * filterHeight *
inChannels]. The convolution is then\n // computed by multiplying these matrices and reshaping the result.\n const
{\n filterWidth,\n filterHeight,\n inChannels,\n outWidth,\n outHeight,\n dataFormat\n } = convInfo;\n\n
const isChannelsLast = dataFormat === 'channelsLast';\n\n const sharedDim = filterWidth * filterHeight *
inChannels;\n const numCols = outHeight * outWidth;\n const x2ColShape = [sharedDim, numCols];\n const
transposeA = true;\n const transposeB = false;\n\n const intermediates: TensorInfo[] = [];\n\n const xSqueezed =\n
reshape({inputs: {x}, backend, attrs: {shape: x.shape.slice(1)}});\n const w2Row = reshape({\n inputs: {x:
filter},\n backend,\n attrs: {shape: [1, sharedDim, util.sizeFromShape(filter.shape) / sharedDim]}\n });\n\n
intermediates.push(xSqueezed);\n intermediates.push(w2Row);\n\n const im2ColProgram =\n new
Im2ColPackedProgram(x2ColShape, xSqueezed.shape, convInfo);\n const im2Col =
backend.runWebGLProgram(im2ColProgram, [xSqueezed], 'float32');\n const im2ColReshaped = reshape({\n
inputs: {x: im2Col},\n backend,\n attrs: {shape: [1, x2ColShape[0], x2ColShape[1]]}\n });\n\n
intermediates.push(im2Col);\n intermediates.push(im2ColReshaped);\n\n const hasBias = bias != null;\n const
hasPreluActivationWeights = preluActivationWeights != null;\n const hasLeakyreluAlpha = activation ===
'leakyrelu';\n const fusedActivation =\n activation ? mapActivationToShaderProgram(activation, true) : null;\n
const matmulProgram = new MatMulPackedProgram(\n im2ColReshaped.shape as [number, number, number],\n
w2Row.shape as [number, number, number],\n [1, numCols, convInfo.outChannels], transposeA, transposeB,
hasBias,\n fusedActivation, hasPreluActivationWeights, hasLeakyreluAlpha);\n const inputs: TensorInfo[] =
[im2ColReshaped, w2Row];\n if (bias) {\n inputs.push(bias);\n }\n if (hasPreluActivationWeights) {\n
inputs.push(reluActivationWeights);\n }\n if (hasLeakyreluAlpha) {\n const $leakyreluAlpha =
backend.makeTensorInfo(\n [], 'float32',\n util.createScalarValue(leakyreluAlpha as {} as 'float32',
'float32'));\n inputs.push($leakyreluAlpha);\n intermediates.push($leakyreluAlpha);\n }\n const product =
backend.runWebGLProgram(matmulProgram, inputs, 'float32');\n\n const outShape = isChannelsLast ?\n [1,
outHeight, outWidth, convInfo.outChannels] :\n [1, convInfo.outChannels, outHeight, outWidth];\n const out
=\n reshape({inputs: {x: product}, backend, attrs: {shape: outShape}});\n\n intermediates.push(product);\n for
(const i of intermediates) {\n backend.disposeIntermediateTensorInfo(i);\n }\n\n return out;\n}\n\n
/*\n *
@license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, env, KernelConfig, KernelFunc, TensorInfo}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport
{Conv2DProgram} from './conv_gpu';\nimport {conv2dByMatMul, conv2dWithIm2Row} from
 './Conv2D_impl';\nimport {reshape} from './Reshape';\n\nexport function conv2d(\n args:\n {inputs:
Conv2DInputs, attrs: Conv2DAttrs, backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n
const {x, filter} = inputs;\n const {strides, pad, dataFormat, dilations, dimRoundingMode} = attrs;\n\n const
$dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo =
backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number],\n filter.shape as
[number, number, number, number], strides, dilations, pad,\n dimRoundingMode, false /* depthwise */,
$dataFormat);\n let out: TensorInfo;\n\n if (convInfo.filterHeight === 1 && convInfo.filterWidth === 1 &&\n
convInfo.dilationHeight === 1 && convInfo.dilationWidth === 1 &&\n convInfo.strideHeight === 1 &&
convInfo.strideWidth === 1 &&\n (convInfo.padInfo.type === 'SAME' || convInfo.padInfo.type === 'VALID'))

```

```
{\n  out = conv2dByMatMul({x, filter, convInfo, backend});\n } else if
(env().getBool('WEBGL_CONV_IM2COL') && x.shape[0] === 1) {\n  out = conv2dWithIm2Row({x, filter,
convInfo, backend});\n } else {\n  const program = new Conv2DProgram(convInfo);\n  out =
backend.runWebGLProgram(program, [x, filter], 'float32');\n }\n\n const outReshaped =\n  reshape({inputs: {x:
out}, backend, attrs: {shape: convInfo.outShape}});\n  backend.disposeIntermediateTensorInfo(out);\n\n return
outReshaped;\n }\n\nexport const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName:
'webgl',\n  kernelFunc: conv2d as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

```
=====\n
*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class Conv2DDerFilterProgram implements GPGPUProgram {\n  variableNames = ['x',
'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const padTop = convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n\n    const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n\n    this.userCode = `
  void main() {\n    ivec4 coords = getOutputCoords();\n    int wR = coords.x;\n    int wC = coords.y;\n    int d1 = coords.z;\n    int d2 = coords.w;\n\n    // Convolve x(?, ?, d1) with dy(:, :, d2) to get dw(wR, wC, d1, d2).\n    // ? = to be
determined. : = across all values in that axis.\n    float dotProd = 0.0;\n\n    for (int b = 0; b <
${convInfo.batchSize}; b++) {\n      for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n        int xR = wR
+ yR * ${strideHeight} - ${padTop};\n\n        if (xR < 0 || xR >= ${convInfo.inHeight}) {\n          continue;\n
        }\n\n        for (int yC = 0; yC < ${convInfo.outWidth}; yC++) {\n          int xC = wC + yC *
${strideWidth} - ${padLeft};\n\n          if (xC < 0 || xC >= ${convInfo.inWidth}) {\n            continue;\n
          }\n\n          if (${isChannelsLast}) {\n            float dyValue = getDy(b, yR, yC, d2);\n            float xValue =
getX(b, xR, xC, d1);\n            dotProd += (xValue * dyValue);\n          } else {\n            float dyValue =
getDy(b, d2, yR, yC);\n            float xValue = getX(b, d1, xR, xC);\n            dotProd += (xValue * dyValue);\n
          }\n\n        }\n      }\n    }\n\n    setOutput(dotProd);\n  }\n};\n\n\nexport class
Conv2DDerInputProgram implements GPGPUProgram {\n  variableNames = ['dy', 'W'];\n  outputShape:
number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape =
convInfo.inShape;\n\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const isChannelsLast =
convInfo.dataFormat === 'channelsLast';\n\n    const padTop = filterHeight - 1 - convInfo.padInfo.top;\n    const
padLeft = filterWidth - 1 - convInfo.padInfo.left;\n\n    const rowDim = isChannelsLast ? 1 : 2;\n    const colDim =
isChannelsLast ? 2 : 3;\n    const channelDim = isChannelsLast ? 3 : 1;\n\n    this.userCode = `
  const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n  void main() {\n    ivec4 coords = getOutputCoords();\n    int batch =
coords[0];\n    int d1 = coords[${channelDim}];\n\n    ivec2 dyCorner = ivec2(coords[${rowDim}],
coords[${colDim}]) - pads;\n    int dyRCorner = dyCorner.x;\n    int dyCCorner = dyCorner.y;\n\n    //
Convolve dy(?, ?, d2) with w(:, :, d1, d2) to compute dx(xR, xC, d1).\n    // ? = to be determined. : = across all
values in that axis.\n    float dotProd = 0.0;\n\n    for (int wR = 0; wR < ${filterHeight}; wR++) {\n      float
dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n      if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n        continue;\n      }\n\n      int idyR = int(dyR);\n\n      int wRPerm = ${filterHeight} -
1 - wR;\n\n      for (int wC = 0; wC < ${filterWidth}; wC++) {\n        float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n\n        if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 || fract(dyC) > 0.0) {\n          continue;\n
        }\n\n        int idyC = int(dyC);\n\n        int wCPerm = ${filterWidth} - 1 - wC;\n\n        for
```

```

(int d2 = 0; d2 < ${convInfo.outChannels}; d2++) {\n\n        if (${isChannelsLast}) {\n            float xValue =
getDy(batch, idyR, idyC, d2);\n            float wValue = getW(wRPerm, wCPerm, d1, d2);\n            dotProd +=
xValue * wValue;\n        } else {\n            float xValue = getDy(batch, d2, idyR, idyC);\n            float
wValue = getW(wRPerm, wCPerm, d1, d2);\n            dotProd += xValue * wValue;\n        }\n\n    }\n    }\n    setOutput(dotProd);\n    }\n    `;\n}\n}\n}\n\nexport class Conv3DDerFilterProgram implements
GPGPUProgram {\n    variableNames = ['x', 'dy'];\n    outputShape: number[];\n    userCode: string;\n\n    constructor(convInfo: backend_util.Conv3DInfo) {\n        this.outputShape = convInfo.filterShape;\n\n        const
strideDepth = convInfo.strideDepth;\n        const strideHeight = convInfo.strideHeight;\n        const strideWidth =
convInfo.strideWidth;\n        const padFront = convInfo.padInfo.front;\n        const padTop = convInfo.padInfo.top;\n
const padLeft = convInfo.padInfo.left;\n\n        this.userCode = `\n        void main() {\n            ivec5 coords =
getOutputCoords();\n            int wF = coords.x;\n            int wR = coords.y;\n            int wC = coords.z;\n            int d1 =
coords.w;\n            int d2 = coords.u;\n\n            float dotProd = 0.0;\n\n            for (int b = 0; b < ${convInfo.batchSize};
b++) {\n                for (int yF = 0; yF < ${convInfo.outDepth}; yF++) {\n                    int xF = wF + yF * ${strideDepth} -
${padFront};\n\n                    if (xF < 0 || xF >= ${convInfo.inDepth}) {\n                        continue;\n                    }\n\n                    for (int
yR = 0; yR < ${convInfo.outHeight}; yR++) {\n                        int xR = wR + yR * ${strideHeight} - ${padTop};\n\n                        if (xR < 0 || xR >= ${convInfo.inHeight}) {\n                            continue;\n                        }\n\n                        for (int yC = 0; yC <
${convInfo.outWidth}; yC++) {\n                            int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n                            if (xC <
0 || xC >= ${convInfo.inWidth}) {\n                                continue;\n                            }\n\n                            float dyValue = getDy(b, yF,
yR, yC, d2);\n                            float xValue = getX(b, xF, xR, xC, d1);\n                            dotProd += (xValue * dyValue);\n                        }\n                    }\n                }\n            }\n            setOutput(dotProd);\n        }\n    `;\n}\n}\n}\n\nexport class
Conv3DDerInputProgram implements GPGPUProgram {\n    variableNames = ['dy', 'W'];\n    outputShape:
number[];\n    userCode: string;\n\n    constructor(convInfo: backend_util.Conv3DInfo) {\n        this.outputShape =
convInfo.inShape;\n\n        const filterDepth = convInfo.filterDepth;\n        const filterHeight = convInfo.filterHeight;\n
const filterWidth = convInfo.filterWidth;\n        const strideDepth = convInfo.strideDepth;\n        const strideHeight =
convInfo.strideHeight;\n        const strideWidth = convInfo.strideWidth;\n\n        const padFront = filterDepth - 1 -
convInfo.padInfo.front;\n        const padTop = filterHeight - 1 - convInfo.padInfo.top;\n        const padLeft = filterWidth -
1 - convInfo.padInfo.left;\n\n        this.userCode = `\n        const ivec3 pads = ivec3(${padFront}, ${padTop},
${padLeft});\n\n        void main() {\n            ivec5 coords = getOutputCoords();\n            int batch = coords.x;\n            int d1
= coords.u;\n\n            ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n            int dyFCorner =
dyCorner.x;\n            int dyRCorner = dyCorner.y;\n            int dyCCorner = dyCorner.z;\n            float dotProd = 0.0;\n
\n            for (int wF = 0; wF < ${filterDepth}; wF++) {\n                float dyF = float(dyFCorner + wF) / ${strideDepth}.0;\n
\n                if (dyF < 0.0 || dyF >= ${convInfo.outDepth}.0 || fract(dyF) > 0.0) {\n                    continue;\n                }\n                int idyF =
int(dyF);\n\n                int wFPerm = ${filterDepth} - 1 - wF;\n\n                for (int wR = 0; wR < ${filterHeight}; wR++)
{\n                    float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n                    if (dyR < 0.0 || dyR >=
${convInfo.outHeight}.0 ||\n                        fract(dyR) > 0.0) {\n                        continue;\n                    }\n                    int idyR =
int(dyR);\n\n                    int wRPerm = ${filterHeight} - 1 - wR;\n\n                    for (int wC = 0; wC < ${filterWidth};
wC++) {\n                        float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n                        if (dyC < 0.0 || dyC >=
${convInfo.outWidth}.0 ||\n                            fract(dyC) > 0.0) {\n                            continue;\n                        }\n                        int idyC =
int(dyC);\n\n                        int wCPerm = ${filterWidth} - 1 - wC;\n\n                        for (int d2 = 0; d2 <
${convInfo.outChannels}; d2++) {\n                            float xValue = getDy(batch, idyF, idyR, idyC, d2);\n                            float
wValue = getW(wFPerm, wRPerm, wCPerm, d1, d2);\n                            dotProd += xValue * wValue;\n                        }\n                    }\n                }\n            }\n            setOutput(dotProd);\n        }\n    `;\n}\n}\n}\n\n/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport { backend_util, Conv2DBackpropFilter, Conv2DBackpropFilterAttrs, Conv2DBackpropFilterInputs,
KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from
'./backend_webgl';\n\nimport { Conv2DDerFilterProgram } from './conv_backprop_gpu';\n\nexport function
conv2DBackpropFilter(args: {\n inputs: Conv2DBackpropFilterInputs,\n attrs: Conv2DBackpropFilterAttrs,\n
backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const
{strides, pad, dataFormat, dimRoundingMode, filterShape} = attrs;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
x.shape as [number, number, number, number], filterShape, strides,\n 1 /* dilations */, pad, dimRoundingMode,
false /* depthwise */,\n $dataFormat);\n\n const program = new Conv2DDerFilterProgram(convInfo);\n return
backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const conv2DBackpropFilterConfig:
KernelConfig = {\n kernelName: Conv2DBackpropFilter,\n backendName: 'webgl',\n kernelFunc:
conv2DBackpropFilter as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport { backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs,
KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from
'./backend_webgl';\n\nimport { Conv2DDerInputProgram } from './conv_backprop_gpu';\n\nexport function
conv2DBackpropInput(args: {\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs,\n
backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const
{inputShape, strides, pad, dataFormat, dimRoundingMode} = attrs;\n\n const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n
inputShape, filter.shape as [number, number, number, number], strides,\n 1 /* dilations */, pad,
dimRoundingMode, false, $dataFormat);\n\n const program = new Conv2DDerInputProgram(convInfo);\n return
backend.runWebGLProgram(program, [dy, filter], 'float32');\n}\n\nexport const conv2DBackpropInputConfig:
KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'webgl',\n kernelFunc:
conv2DBackpropInput as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport { backend_util, Conv3D, Conv3DAttrs, Conv3DInputs, KernelConfig, KernelFunc } from
'@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from './backend_webgl';\n\nimport { Conv3DProgram }
from './conv_gpu';\n\nexport function conv3D(\n args:\n {inputs: Conv3DInputs, attrs: Conv3DAttrs,
backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const
{strides, pad, dilations} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n x.shape as [number,
number, number, number, number],\n filter.shape as [number, number, number, number, number], strides,\n
dilations, pad);\n\n const program = new Conv3DProgram(convInfo);\n return
backend.runWebGLProgram(program, [x, filter], 'float32');\n}\n\nexport const conv3DConfig: KernelConfig = {\n
kernelName: Conv3D,\n backendName: 'webgl',\n kernelFunc: conv3D as {} as KernelFunc,\n};\n\n"/**\n *

```

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```
=====\n*\n\nimport { backend_util, Conv3DBackpropFilterV2, Conv3DBackpropFilterV2Attrs,
Conv3DBackpropFilterV2Inputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from './backend_webgl';\nimport {Conv3DDerFilterProgram} from
'./conv_backprop_gpu';\nexport function conv3DBackpropFilterV2(args: {\n inputs:
Conv3DBackpropFilterV2Inputs,\n attrs: Conv3DBackpropFilterV2Attrs,\n backend: MathBackendWebGL\n})
{\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const {strides, pad, filterShape} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n x.shape as [number, number, number, number, number],
filterShape, strides,\n 1 /* dilations */, pad);\n\n const program = new Conv3DDerFilterProgram(convInfo);\n return backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const
conv3DBackpropFilterV2Config: KernelConfig = {\n kernelName: Conv3DBackpropFilterV2,\n backendName:
'webgl',\n kernelFunc: conv3DBackpropFilterV2 as { } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020
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```

```
=====\n*\n\nimport { backend_util, Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs,
Conv3DBackpropInputV2Inputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from './backend_webgl';\nimport {Conv3DDerInputProgram} from
'./conv_backprop_gpu';\nexport function conv3DBackpropInput(args: {\n inputs:
Conv3DBackpropInputV2Inputs,\n attrs: Conv3DBackpropInputV2Attrs,\n backend: MathBackendWebGL\n})
{\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const {pad, strides, inputShape} =
attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n inputShape, filter.shape as [number, number,
number, number, number],\n strides, 1 /* dilations */, pad);\n\n const program = new
Conv3DDerInputProgram(convInfo);\n return backend.runWebGLProgram(program, [dy, filter],
'float32');\n}\n\nexport const conv3DBackpropInputConfig: KernelConfig = {\n kernelName:
Conv3DBackpropInputV2,\n backendName: 'webgl',\n kernelFunc: conv3DBackpropInput as { } as
KernelFunc,\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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```

```
=====\n*\n\nimport { Cos, KernelConfig } from '@tensorflow/tfjs-core';\nimport {CHECK_NAN_SNIPPET_UNARY,
unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\nconst COS = CHECK_NAN_SNIPPET_UNARY +
`\n return cos(x);\n`;\nexport const cos = unaryKernelFunc({opSnippet: COS});\nexport const cosConfig:
KernelConfig = {\n kernelName: Cos,\n backendName: 'webgl',\n kernelFunc: cos,\n};\n"/**\n * @license\n *
```

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```
=====\n*\n\nimport { Cosh, KernelConfig } from '@tensorflow/tfjs-core';\nimport { unaryKernelFunc } from  
 './kernel_utils/kernel_funcs_utils';\n\nconst COSH = `float e2x = exp(-x);\n return (e2x + 1.0 / e2x) /  
 2.0;`\n\nexport const cosh = unaryKernelFunc({ opSnippet: COSH });\nexport const coshConfig: KernelConfig  
 = {\n kernelName: Cosh,\n backendName: 'webgl',\n kernelFunc: cosh,\n};\n\n\"/*\n * @license\n * Copyright  
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 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
```

```
\n\nimport { GPGPUProgram } from './gpgpu_math';\nexport class CropAndResizeProgram implements  
 GPGPUProgram {\n variableNames = ['Image', 'Boxes', 'BoxInd'];\n outputShape: number[] = [];\n userCode:  
 string;\n constructor(\n imageShape: [number, number, number, number], boxShape: [number, number],\n cropSize: [number, number], method: 'bilinear'|'nearest',\n extrapolationValue: number) {\n const [batch,  
 imageHeight, imageWidth, depth] = imageShape;\n const [numBoxes, ] = boxShape;\n const [cropHeight,  
 cropWidth] = cropSize;\n this.outputShape = [numBoxes, cropHeight, cropWidth, depth];\n const methodId =  
 method === 'bilinear' ? 1 : 0;\n const [inputHeightFloat, inputWidthFloat] = [\n ` ${imageHeight - 1} .0`,  
 ` ${imageWidth - 1} .0`];\n const [heightRatio, heightScale, inY] = cropHeight > 1 ? [\n ` ${imageHeight - 1} / (cropHeight - 1)`,\n `(y2-y1) * height_ratio`,\n ` y1 * ${inputHeightFloat} +  
 float(y) * (height_scale)`,\n ] : [\n ` 0.0`,\n ` 0.0`,\n ` 0.5 * (y1+y2) * ${inputHeightFloat}`,\n ];\n const [widthRatio, widthScale, inX] = cropWidth > 1 ? [\n ` ${imageWidth - 1} / (cropWidth -  
 1)`,\n `(x2-x1) * width_ratio`,\n ` x1 * ${inputWidthFloat} + float(x) * (width_scale)`,\n ] : [\n ` 0.0`,\n ` 0.0`,\n ` 0.5 * (x1+x2) * ${inputWidthFloat}`,\n ];\n // Reference implementation\n //  
 tslint:disable-next-line:max-line-length\n //  
 https://github.com/tensorflow/tensorflow/blob/master/tensorflow/core/kernels/crop_and_resize_op_gpu.cu.cc\n this.userCode = `\n const float height_ratio = float(${heightRatio});\n const float width_ratio =  
 float(${widthRatio});\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int  
 y = coords[1];\n int x = coords[2];\n int d = coords[3];\n // get box vals\n float y1 =  
 getBoxes(b,0);\n float x1 = getBoxes(b,1);\n float y2 = getBoxes(b,2);\n float x2 = getBoxes(b,3);\n\n // get image in batch index\n int bInd = round(getBoxInd(b));\n if(bInd < 0 || bInd >= ${batch}) {\n return;\n }\n float height_scale = ${heightScale};\n float width_scale = ${widthScale};\n float  
 in_y = ${inY};\n if( in_y < 0.0 || in_y > ${inputHeightFloat} ) {\n setOutput(float(${extrapolationValue}));\n return;\n }\n float in_x = ${inX};\n if( in_x < 0.0 ||  
 in_x > ${inputWidthFloat} ) {\n setOutput(float(${extrapolationValue}));\n return;\n }\n vec2  
 sourceFracIndexCR = vec2(in_x,in_y);\n if(${methodId} == 1) {\n // Compute the four integer indices.\n ivec2 sourceFloorCR = ivec2(sourceFracIndexCR);\n ivec2 sourceCeilCR =  
 ivec2(ceil(sourceFracIndexCR));\n float topLeft = getImage(b, sourceFloorCR.y, sourceFloorCR.x, d);\n float bottomLeft = getImage(b, sourceCeilCR.y, sourceFloorCR.x, d);\n float topRight = getImage(b,  
 sourceFloorCR.y, sourceCeilCR.x, d);\n float bottomRight = getImage(b, sourceCeilCR.y, sourceCeilCR.x,  
 d);\n vec2 fracCR = sourceFracIndexCR - vec2(sourceFloorCR);\n float top = topLeft + (topRight -
```



```

topLeft) * fracCR.x;\n      float bottom = bottomLeft + (bottomRight - bottomLeft) * fracCR.x;\n      float
newValue = top + (bottom - top) * fracCR.y;\n      setOutput(newValue);\n    } else {\n      // Compute the
coordinators of nearest neighbor point.\n      ivec2 sourceNearestCR = ivec2(floor(\n      sourceFracIndexCR +
vec2(0.5,0.5));\n      float newValue = getImage(b, sourceNearestCR.y, sourceNearestCR.x, d);\n
setOutput(newValue);\n    }\n  }\n};\n}\n}\n";\n}\n}\n";\n}

```

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```

=====
*\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{CropAndResizeProgram} from './crop_and_resize_gpu';\n\nexport const cropAndResize = (args: {\n inputs:
CropAndResizeInputs,\n backend: MathBackendWebGL,\n attrs: CropAndResizeAttrs\n}): TensorInfo => {\n
const {inputs, backend, attrs} = args;\n const {image, boxes, boxInd} = inputs;\n const {cropSize, method,
extrapolationValue} = attrs;\n\n const program = new CropAndResizeProgram(\n image.shape as [number,
number, number, number],\n boxes.shape as [number, number], cropSize, method, extrapolationValue);\n return
backend.runWebGLProgram(program, [image, boxes, boxInd], 'float32');\n};\n\nexport const
cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'webgl',\n kernelFunc:
cropAndResize as {} as KernelFunc\n};\n};\n";\n}

```

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=====
*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport
{getCoordsDataType} from './shader_compiler';\n\nexport class CumSumProgram implements GPGPUProgram {\n
variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n // Caching uniform location for speed.\n
index: WebGLUniformLocation;\n\n constructor(shape: number[], exclusive: boolean, reverse: boolean) {\n
this.outputShape = shape;\n const rank = shape.length;\n const val = exclusive ? '0.0' : `getX(${getCoords(rank,
'coords')})`; \n const length = shape[shape.length - 1];\n let condition = ";\n let idxString = ";\n // When
exclusive is set, the cumsum op becomes roll op that copies the\n // value from the previous index based on the
direction specified by the\n // reverse flag.\n if (exclusive) {\n condition = reverse ? `end != ${length - 1}` :
`end != 0`;\n idxString = reverse ? `end + 1` : `end - 1`;\n } else {\n condition = reverse ? `end + pow2 <
${length}` : `end >= pow2`;\n idxString = (reverse ? `end + pow2` : `end - pow2`);\n }\n\n this.userCode = `\n
uniform float index;\n void main() {\n ${getCoordsDataType(rank)} coords = getOutputCoords();\n int
end = ${getFinalCoord(rank, 'coords')};\n float val = ${val};\n int pow2 = int(pow(2.0, index));\n if
(${condition}) {\n int idx = ${idxString};\n ${getFinalCoord(rank, 'coords')} = idx;\n val +=
getX(${getCoords(rank, 'coords')});\n }\n setOutput(val);\n }\n `;\n}\n\n
getCustomSetupFunc(index: number) {\n return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) =>
{\n if (this.index == null) {\n this.index = gpgpu.getUniformLocation(webGLProgram, 'index');\n }\n
gpgpu.gl.uniform1f(this.index, index);\n }; \n}\n}\n\nfunction getCoords(rank: number, name: string): string {\n
if (rank === 1) {\n return `${name}`;\n } else if (rank === 2) {\n return `${name}.x, ${name}.y`;\n } else if
(rank === 3) {\n return `${name}.x, ${name}.y, ${name}.z`;\n } else if (rank === 4) {\n return `${name}.x,

```

```

    ${name}.y, ${name}.z, ${name}.w`;
  } else {
    throw Error(`Cumulative sum for rank ${rank} is not yet supported`);
  }
}

function getFinalCoord(rank: number, name: string): string {
  if (rank === 1) {
    return `${name}`;
  } else if (rank === 2) {
    return `${name}.y`;
  } else if (rank === 3) {
    return `${name}.z`;
  } else if (rank === 4) {
    return `${name}.w`;
  } else {
    throw Error(`Cumulative sum for rank ${rank} is not yet supported`);
  }
}

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 */

```

```

=====
*/

import { backend_util, Cumsum, CumsumAttrs, CumsumInputs, KernelConfig, KernelFunc, TensorInfo } from '@tensorflow/tfjs-core';
import { MathBackendWebGL } from '../backend_webgl';
import { CumsumProgram } from '../cumsum_gpu';
import { identity } from './Identity';
import { transpose } from './Transpose';

export function cumsum(
  args: {
    inputs: CumsumInputs, backend: MathBackendWebGL, attrs: CumsumAttrs
  }): TensorInfo {
  const { inputs, backend, attrs } = args;
  const { x } = inputs;
  const { axis, exclusive, reverse } = attrs;

  const xRank = x.shape.length;
  const permutation = backend_util.getAxesPermutation([axis], xRank);

  let permutedX = x;
  if (permutation !== null) {
    permutedX = transpose({ inputs: { x }, backend, attrs: { perm: permutation } });
  }

  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];
  if (permutedAxis !== xRank - 1) {
    throw new Error(`WebGL cumsum shader expects an inner-most axis=${x.shape.length - 1} but got axis=${axis}`);
  }

  const size = permutedX.shape[permutedAxis];
  let result = identity({ inputs: { x: permutedX }, backend });
  // Use cumsum parallel algorithm, ref:
  // https://developer.nvidia.com/gpugems/gpugems3/part-vi-gpu-computing/chapter-39-parallel-prefix-sum-scan-cuda
  for (let i = 0; i <= Math.ceil(Math.log2(size)) - 1; i++) {
    const program = new CumsumProgram(permutedX.shape, false, reverse);
    const customSetup = program.getCustomSetupFunc(i);
    const prevResult = result;
    result = backend.runWebGLProgram(program, [result], result.dtype, customSetup);
    backend.disposeIntermediateTensorInfo(prevResult);
  }

  // For exclusive cumsum, shift the end result in the direction of sum
  // and add 0 to the front index.
  if (exclusive) {
    const program = new CumsumProgram(permutedX.shape, exclusive, reverse);
    const prevResult = result;
    result = backend.runWebGLProgram(program, [result], result.dtype);
    backend.disposeIntermediateTensorInfo(prevResult);
  }

  if (permutation !== null) {
    const reversePermutation = backend_util.getUndoAxesPermutation(permutation);
    const reverseTransposedResult = transpose({ inputs: { x: result }, backend, attrs: { perm: reversePermutation } });
    backend.disposeIntermediateTensorInfo(result);
    backend.disposeIntermediateTensorInfo(permutedX);
    return reverseTransposedResult;
  }

  return result;
}

export const cumsumConfig: KernelConfig = {
  kernelName: 'Cumsum',
  backendName: 'webgl',
  kernelFunc: cumsum as {} as KernelFunc
};

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 */

```

```

=====
*/

import { DenseBincount, DenseBincountAttrs, DenseBincountInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray } from '@tensorflow/tfjs-core';
import { MathBackendWebGL } from '../backend_webgl';
import { bincountImplCPU, bincountReduceImplCPU } from '../kernel_utils/shared';

export function denseBincount(
  args: {
    inputs: DenseBincountInputs, backend: MathBackendWebGL, attrs: DenseBincountAttrs
  }): TensorInfo

```



```
(dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3]\n : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight,\n outputWidth];\n\n const program = new DepthToSpaceProgram(outputShape, blockSize, dataFormat);\n return\n backend.runWebGLProgram(program, [x], x.dtype);\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'webgl',\n kernelFunc: depthToSpace as {\n KernelFunc\n};\n}"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
```

```
=====\n\n*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from\n './gpgpu_math';\n\nexport class DepthwiseConv2DProgram implements GPGPUProgram {\n variableNames = ['x',\n 'W'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n convInfo: backend_util.Conv2DInfo,\n addBias = false,\n activation: string = null, hasPreluActivation = false,\n hasLeakyReluAlpha = false) {\n this.outputShape = convInfo.outShape;\n\n const xNumRows = convInfo.inHeight;\n const xNumCols =\n convInfo.inWidth;\n const padTop = convInfo.padInfo.top;\n const padLeft = convInfo.padInfo.left;\n const\n strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const dilationHeight =\n convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const filterHeight =\n convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const channelMul = convInfo.outChannels /\n convInfo.inChannels;\n\n let activationSnippet = "", applyActivationSnippet = "";\n if (activation) {\n if\n (hasPreluActivation) {\n activationSnippet = `float activation(float a) {\n float b =\n getPreluActivationWeightsAtOutCoords();\n ${activation}\n }`;\n } else if (hasLeakyReluAlpha) {\n\n activationSnippet = `float activation(float a) {\n float b = getLeakyreluAlphaAtOutCoords();\n\n ${activation}\n }`;\n } else {\n activationSnippet = `\n float activation(float x) {\n\n ${activation}\n }\n `;\n }\n\n applyActivationSnippet = `result = activation(result)`;\n }\n\n const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords()';\n if (addBias) {\n\n this.variableNames.push('bias');\n }\n\n if (hasPreluActivation) {\n\n this.variableNames.push('preluActivationWeights');\n }\n\n if (hasLeakyReluAlpha) {\n\n this.variableNames.push('leakyreluAlpha');\n }\n\n this.userCode = `\n ${activationSnippet}\n\n const\n ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n void main() {\n ivec4 coords = getOutputCoords();\n int batch = coords.x;\n ivec2 xRCCorner =\n coords.yz * strides - pads;\n int d2 = coords.w;\n int d1 = d2 / ${channelMul};\n int q = d2 - d1 *\n ${channelMul};\n\n int xRCorner = xRCCorner.x;\n int xCCorner = xRCCorner.y;\n\n // Convolve x(\n ?, d1) with w(:, :, d1, q) to get y(yR, yC, d2).\n // ? = to be determined. : = across all values in that axis.\n float dotProd = 0.0;\n // TO DO(dsmilkov): Flatten the two for loops and vec4 the operations.\n for (int wR\n = 0; wR < ${filterHeight}; wR++) {\n int xR = xRCorner + wR * ${dilationHeight};\n\n if (xR < 0 || xR\n >= ${xNumRows}) {\n continue;\n }\n\n for (int wC = 0; wC < ${filterWidth}; wC++) {\n\n int xC = xCCorner + wC * ${dilationWidth};\n\n if (xC < 0 || xC >= ${xNumCols}) {\n continue;\n\n }\n\n float xVal = getX(batch, xR, xC, d1);\n float wVal = getW(wR, wC, d1, q);\n dotProd\n += xVal * wVal;\n }\n }\n\n float result = dotProd;\n ${addBiasSnippet}\n\n ${applyActivationSnippet}\n\n setOutput(result);\n }\n `;\n }\n\n}"/**\n * @license\n * Copyright 2018\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *
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```

=====
*\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConvPacked2DProgram implements GPGPUProgram {\n  variableNames
= ['x', 'W'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv2DInfo, addBias = false,\n    activation: string = null,\n    hasPreluActivation = false,\n    hasLeakyReluAlpha = false) {\n    this.outputShape = convInfo.outShape;\n\n    const xNumRows = convInfo.inHeight;\n    const xNumCols = convInfo.inWidth;\n    const padTop =
convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n
const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const
dilationWidth = convInfo.dilationWidth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const texelsAcross = filterWidth;\n\n    let mainLoop = `int xR; int xC; int xCOffset;`\n
for (let r = 0; r < filterHeight; r++) {\n  for (let c = 0; c < filterWidth; c++) {\n    mainLoop += `\n    vec4
xTexelR${r}C${c * 2} = vec4(0.);\n    vec4 wR${r}C${c} = vec4(0.);\n    vec4 xR${r}C${c} = vec4(0.);`\n
  }\n  }\n  /**\n   * This vectorized implementation works by gathering the values needed for\n   * each
output channel's dot product into vec4's and then multiplying them\n   * all together (this happens in the final
double for-loop below). Most of\n   * the main loop consists of constructing these vec4's with the minimum\n   *
number of texture2D calls, which means making use of all four returned\n   * values from a texture2D call at
once.\n   */\n  for (let r = 0; r < filterHeight; r++) {\n    for (let texelC = 0; texelC < texelsAcross; texelC++) {\n
      const c = texelC * 2;\n\n      mainLoop += `\n        xR = xRCorner + ${r * dilationHeight};\n        xC =
xCCorner + ${c * dilationWidth};\n        `;\n\n      if (strideWidth === 1) {\n        if (c < filterWidth) {\n          //
If padding is odd, the outer texels have to be composed.\n          if (padLeft % 2 === 1) {\n            // TODO:
Ensure vec4 previous does not result in redundant sample,\n            // and avoid setting xTexelRC's that exceed the
boundary in the\n            // first place rather than resetting them to vec4(0)).\n            // To compute xCOffset:\n
            // - If padding is odd, we must add 1 to ensure we ask for an\n            // even-numbered row.\n            // -
We subtract 2 to access the previous texel.\n\n            mainLoop += `\n              xCOffset = xC + 1;\n
if(xR >= 0 && xR < ${xNumRows} && xCOffset >= 0 && xCOffset < ${\n              xNumCols}) {\n
xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n\n              // Need to manually clear unused channels in
case\n              // we're reading from recycled texture.\n              if(xCOffset + 1 >= ${xNumCols}) {\n
xTexelR${r}C${c}.zw = vec2(0.);          }\n              } else {\n                xTexelR${r}C${c} = vec4(0.);
\n                }\n                xCOffset = xC + 1 - 2;\n                if(xR >= 0 && xR < ${xNumRows} && xCOffset >= 0
&& xCOffset < ${\n                xNumCols}) {\n                  vec4 previous = getX(batch, xR, xCOffset, d1);\n
\n                  // Need to manually clear unused channels in case\n                  // we're reading from recycled texture.\n
if(xCOffset + 1 >= ${xNumCols}) {\n                    previous.zw = vec2(0.);          }\n\n                    xR${r}C${c} =
vec4(previous.zw, xTexelR${r}C${c}.xy);\n                    } else {\n                      xR${r}C${c} = vec4(0,
0, xTexelR${r}C${c}.xy);\n                      }\n                      `;\n                      } else {\n                        //
Padding is even, so xRC
corresponds to a single texel.\n                        mainLoop += `\n                          if(xR >= 0 && xR < ${xNumRows} && xC >=
0 && xC < ${xNumCols}) {\n                            xTexelR${r}C${c} = getX(batch, xR, xC, d1);\n                            }
else {\n                              xTexelR${r}C${c} = vec4(0.);          }\n                              }\n                              xR${r}C${c} =
xTexelR${r}C${c};\n                              `;\n                              }\n                              if (c + 1 < filterWidth) {\n                                // If dilation is even, the second entry should match the first\n
\n                                // (either both are composed or both are single samples). But if\n                                //
dilation is odd, then the second entry
should be the opposite\n                                // of the first (if the first is composed, the second is a single\n                                //
sample,
and vice versa.)\n                                const nextTexelOffset = padLeft % 2 === 0 ?\n                                util.nearestLargerEven(dilationWidth) : \n                                dilationWidth;\n                                if ((dilationWidth % 2 === 0 &&
padLeft % 2 === 1) ||\n                                (dilationWidth % 2 !== 0 && padLeft % 2 !== 1)) {\n                                  mainLoop += `

```

```

        xCOffset = xC + ${padLeft % 2} + ${nextTexelOffset};\n\n        if(xR >= 0 && xR <
${xNumRows} &&\n        xCOffset >= 0 && xCOffset < ${xNumCols}) {\n        xTexelR${r}C${c}$
+ 2 = getX(batch, xR, xCOffset, d1);\n        }\n        `;\n\n        // If dilation > 1 then the xRC's will
not be able to share any\n        // values, so each xRC will require two unique calls to getX.\n        if
(dilationWidth > 1) {\n        mainLoop += `\n        xCOffset -= 2;\n        if(xR >= 0 && xR <
${xNumRows} &&\n        xCOffset >= 0 && xCOffset < ${xNumCols}) {\n
xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n        } else {\n        xTexelR${r}C${c} =
vec4(0.);\n        }\n        `;\n        }\n\n        mainLoop += `\n        xR${r}C${c + 1} =
vec4(\n        xTexelR${r}C${c}.zw, xTexelR${r}C${c + 2}.xy);\n        `;\n        } else {\n
mainLoop += `\n        xCOffset = xC + ${nextTexelOffset};\n\n        if(xR >= 0 && xR <
${xNumRows} &&\n        xCOffset >= 0 && xCOffset < ${xNumCols}) {\n        xTexelR${r}C${c}$
+ 2 = getX(batch, xR, xCOffset, d1);\n        }\n\n        xR${r}C${c + 1} = xTexelR${r}C${c + 2};\n
        `;\n        }\n        }\n        } else { // stride > 1\n        if (c < filterWidth) {\n        mainLoop
+= `\n        if(xR >= 0 && xR < ${xNumRows}) {\n        `;\n\n        // Depending on whether padLeft is
even or odd, we want either the\n        // xy or zw channels from X texels for xR${r}C${c}. If padLeft is\n
// even, xR${r}C${c + 1} is simply the zw channels of texels we've\n        // already sampled. But if padLeft is
odd, xR${r}C${c + 1}.zw will\n        // need to come from the xy channels of a new texel, hence the `vec4\n
// final` initialized below.\n        if (padLeft % 2 === 1) {\n        mainLoop += `\n        xCOffset = xC + 1
- ${strideWidth};\n        if(xCOffset >= 0 && xCOffset < ${xNumCols}) {\n        xTexelR${r}C${c} =
getX(batch, xR, xCOffset, d1);\n        } else {\n        xTexelR${r}C${c} = vec4(0.);\n        }\n\n
        if(xC + 1 >= 0 && xC + 1 < ${xNumCols}) {\n        xTexelR${r}C${c + 2} = getX(batch, xR, xC + 1,
d1);\n        } else {\n        xTexelR${r}C${c + 2} = vec4(0.);\n        }\n\n        xR${r}C${c} =
vec4(\n        xTexelR${r}C${c}.zw, xTexelR${r}C${c + 2}.zw);\n        `;\n\n        if (c + 1 <
filterWidth) {\n        mainLoop += `\n        vec4 final = vec4(0.);\n        xCOffset = xC + 1 +
${strideWidth};\n        if(xCOffset >= 0 && xCOffset < ${xNumCols}) {\n        final = getX(batch,
xR, xCOffset, d1);\n        }\n        xR${r}C${c + 1} = vec4(xTexelR${r}C${c + 2}.xy, final.xy);\n
        `;\n        }\n        } else {\n        mainLoop += `\n        if(xC >= 0 && xC < ${xNumCols}) {\n
        xTexelR${r}C${c} = getX(batch, xR, xC, d1);\n        } else {\n        xTexelR${r}C${c} =
vec4(0.);\n        }\n\n        xCOffset = xC + ${strideWidth};\n        if(xCOffset >= 0 && xCOffset <
${xNumCols}) {\n        xTexelR${r}C${c + 2} = getX(batch, xR, xCOffset, d1);\n        } else {\n
        xTexelR${r}C${c + 2} = vec4(0.);\n        }\n\n        xR${r}C${c} = vec4(\n
xTexelR${r}C${c}.xy, xTexelR${r}C${c + 2}.xy);\n        `;\n\n        if (c + 1 < filterWidth) {\n
mainLoop += `\n        xR${r}C${c + 1} = vec4(\n        xTexelR${r}C${c}.zw, xTexelR${r}C${c +
2}.zw);\n        `;\n        }\n        }\n\n        mainLoop += `};\n        }\n        }\n\n        if (c <
filterWidth) {\n        mainLoop += `\n        vec4 wTexelR${r}C${c} = getW(${r}, ${c}, d1, q);\n
wR${r}C${c} = vec4(wTexelR${r}C${c}.xz, wTexelR${r}C${c}.xz);\n        `;\n\n        if (c + 1 < filterWidth)
{\n        mainLoop += `\n        vec4 wTexelR${r}C${c + 1} = getW(${r}, ${c + 1}, d1, q);\n
wR${r}C${c + 1} =\n        vec4(wTexelR${r}C${c + 1}.xz, wTexelR${r}C${c + 1}.xz);\n        }\n        }\n
}\n        }\n\n        for (let r = 0; r < filterHeight; r++) {\n        for (let c = 0; c < filterWidth; c++) {\n        mainLoop +=
`\n        dotProd += xR${r}C${c} * wR${r}C${c};\n        }\n        }\n\n        let activationSnippet = ", applyActivationSnippet =
";\n        if (activation) {\n        if (hasPreluActivation) {\n        activationSnippet = `vec4 activation(vec4 a) {\n
vec4 b = getPreluActivationWeightsAtOutCoords();\n        ${activation}\n        `;\n        } else if
(hasLeakyReluAlpha) {\n        activationSnippet = `vec4 activation(vec4 a) {\n        vec4 b =
getLeakyreluAlphaAtOutCoords();\n        ${activation}\n        `;\n        } else {\n        activationSnippet = `vec4
activation(vec4 x) {\n        ${activation}\n        `;\n        }\n\n        applyActivationSnippet = `result =
activation(result);\n        }\n\n        const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : '';\n        if
(addBias) {\n        this.variableNames.push('bias');\n        }\n\n        if (hasPreluActivation) {\n
this.variableNames.push('preluActivationWeights');\n        }\n        if (hasLeakyReluAlpha) {\n

```

```

this.variableNames.push('leakyreluAlpha');\n  }\n\n  this.userCode = `\n    ${activationSnippet}\n\n    const
ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n    void main() {\n\n      ivec4 coords = getOutputCoords();\n      int batch = coords.x;\n      ivec2 xRCCorner =
coords.yz * strides - pads;\n      int d2 = coords.w;\n      int d1 = d2;\n      int q = 0;\n      int xRCorner =
xRCCorner.x;\n      int xCCorner = xRCCorner.y;\n      vec4 dotProd = vec4(0.);\n\n      ${mainLoop}\n\n      vec4 result = dotProd;\n      ${addBiasSnippet}\n      ${applyActivationSnippet}\n      setOutput(result);\n    }\n  }\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, env, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from './backend_webgl';\n\nimport {DepthwiseConv2DProgram} from
'./conv_gpu_depthwise';\n\nimport {DepthwiseConvPacked2DProgram} from
'./conv_packed_gpu_depthwise';\n\nexport function depthwiseConv2dNative(args: {\n  inputs:
DepthwiseConv2dNativeInputs,\n  attrs: DepthwiseConv2dNativeAttrs,\n  backend: MathBackendWebGL\n}) {\n
const {inputs, backend, attrs} = args;\n  const {x, filter} = inputs;\n  const {strides, pad, dilations,
dimRoundingMode} = attrs;\n\n  let $dilations = dilations;\n  if ($dilations == null) {\n    $dilations = [1, 1];\n  }\n\n  util.assert(\n    backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n    () => 'Error in
depthwiseConv2d: Either strides or dilations must be ' +\n      `1. Got strides ${strides} and dilations
'${$dilations}`);\n\n  const convInfo = backend_util.computeConv2DInfo(\n    x.shape as [number, number,
number, number],\n    filter.shape as [number, number, number, number],\n    strides, $dilations,\n    pad,
dimRoundingMode, true /* depthwise */);\n\n  let program:
DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n  if
(env().getBool('WEBGL_PACK_DEPTHWISECONV') && convInfo.strideWidth <= 2 &&\n
convInfo.outChannels / convInfo.inChannels === 1) {\n    program = new
DepthwiseConvPacked2DProgram(convInfo);\n  } else {\n    program = new
DepthwiseConv2DProgram(convInfo);\n  }\n\n  return backend.runWebGLProgram(program, [x, filter],
'float32');\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n  kernelName:
DepthwiseConv2dNative,\n  backendName: 'webgl',\n  kernelFunc: depthwiseConv2dNative as {\n\n} as
KernelFunc,\n};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConv2DDerFilterProgram implements GPGPUProgram {\n
variableNames = ['x', 'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const padTop = convInfo.padInfo.top;\n
const padLeft = convInfo.padInfo.left;\n    const channelMul = convInfo.outChannels / convInfo.inChannels;\n\n

```

```

this.userCode = `
  void main() {
    ivec4 coords = getOutputCoords();
    int wR = coords.x;
    int wC = coords.y;
    int d1 = coords.z;
    int dm = coords.w;
    int d2 = d1 * ${channelMul} + dm;
    float dotProd = 0.0;
    // TO DO: Vec4 over the batch size
    for (int b = 0; b < ${convInfo.batchSize}; b++) {
      for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {
        int xR = wR + yR * ${strideHeight} - ${padTop};
        if (xR < 0 || xR >= ${convInfo.inHeight}) {
          continue;
        }
        for (int yC = 0; yC < ${convInfo.outWidth}; yC++) {
          int xC = wC + yC * ${strideWidth} - ${padLeft};
          if (xC < 0 || xC >= ${convInfo.inWidth}) {
            continue;
          }
          float dyValue = getDy(b, yR, yC, d2);
          float xValue = getX(b, xR, xC, d1);
          dotProd += (xValue * dyValue);
        }
      }
      setOutput(dotProd);
    }
  }
`;
}

export class DepthwiseConv2DDerInputProgram implements GPGPUProgram {
  variableNames = ['dy', 'W'];
  outputShape: number[];
  userCode: string;

  constructor(convInfo: backend_util.Conv2DInfo) {
    this.outputShape = convInfo.inShape;
    const filterHeight = convInfo.filterHeight;
    const filterWidth = convInfo.filterWidth;
    const strideHeight = convInfo.strideHeight;
    const strideWidth = convInfo.strideWidth;
    const padTop = filterHeight - 1 - convInfo.padInfo.top;
    const padLeft = filterWidth - 1 - convInfo.padInfo.left;
    const channelMul = convInfo.outChannels / convInfo.inChannels;

    this.userCode = `
      const ivec2 pads = ivec2(${padTop}, ${padLeft});
      void main() {
        ivec4 coords = getOutputCoords();
        int batch = coords[0];
        int d1 = coords[3];
        ivec2 dyCorner = coords.yz - pads;
        int dyRCorner = dyCorner.x;
        int dyCCorner = dyCorner.y;
        float dotProd = 0.0;
        for (int wR = 0; wR < ${filterHeight}; wR++) {
          float dyR = float(dyRCorner + wR) / ${strideHeight}.0;
          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {
            continue;
          }
          int idyR = int(dyR);
          int wRPerm = ${filterHeight} - 1 - wR;
          for (int wC = 0; wC < ${filterWidth}; wC++) {
            float dyC = float(dyCCorner + wC) / ${strideWidth}.0;
            if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 || fract(dyC) > 0.0) {
              continue;
            }
            int idyC = int(dyC);
            int wCPerm = ${filterWidth} - 1 - wC;
            // TO DO: Vec4 over the channelMul
            for (int dm = 0; dm < ${channelMul}; dm++) {
              int d2 = d1 * ${channelMul} + dm;
              float xValue = getDy(batch, idyR, idyC, d2);
              float wValue = getW(wRPerm, wCPerm, d1, dm);
              dotProd += xValue * wValue;
            }
          }
          setOutput(dotProd);
        }
      }
    `;
  }
}

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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
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 */
=====
import { backend_util, DepthwiseConv2dNativeBackpropFilter, DepthwiseConv2dNativeBackpropFilterAttrs, DepthwiseConv2dNativeBackpropFilterInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';
import { MathBackendWebGL } from '../backend_webgl';
import { DepthwiseConv2DDerFilterProgram } from './conv_backprop_gpu_depthwise';
export function depthwiseConv2dNativeBackpropFilter(args: {
  inputs: DepthwiseConv2dNativeBackpropFilterInputs,
  attrs: DepthwiseConv2dNativeBackpropFilterAttrs,
  backend: MathBackendWebGL
}) {
  const { inputs, backend, attrs } = args;
  const { x, dy } = inputs;
  const { strides, dilations, pad, dimRoundingMode, filterShape } = attrs;
  const convInfo = backend_util.computeConv2DInfo(x.shape as [number, number, number, number], filterShape, strides, dilations, pad, dimRoundingMode, true /* depthwise */);
  const program = new DepthwiseConv2DDerFilterProgram(convInfo);
  return backend.runWebGLProgram(program, [x, dy], 'float32');
}

export const depthwiseConv2dNativeBackpropFilterConfig: KernelConfig = {
  kernelName: DepthwiseConv2dNativeBackpropFilter,
  backendName: 'webgl',
  kernelFunc: depthwiseConv2dNativeBackpropFilter as {} as KernelFunc
};
/**
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```


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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, DepthwiseConv2dNativeBackpropInput, DepthwiseConv2dNativeBackpropInputAttrs,  
DepthwiseConv2dNativeBackpropInputInputs, KernelConfig, KernelFunc } from '@tensorflow/tfjs-core';\nimport  
{ MathBackendWebGL } from './backend_webgl';\nimport { DepthwiseConv2DDerInputProgram } from  
 './conv_backprop_gpu_depthwise';\n\nexport function depthwiseConv2dNativeBackpropInput(args: {\n  inputs:  
  DepthwiseConv2dNativeBackpropInputInputs,\n  attrs: DepthwiseConv2dNativeBackpropInputAttrs,\n  backend:  
  MathBackendWebGL\n}) {\n  const { inputs, backend, attrs } = args;\n  const { dy, filter } = inputs;\n  const { strides,  
  dilations, pad, dimRoundingMode, inputShape } = attrs;\n\n  const convInfo = backend_util.computeConv2DInfo(\n    inputShape, filter.shape as [number, number, number, number], strides,\n    dilations, pad, dimRoundingMode,  
    true /* depthwise */);\n\n  const program = new DepthwiseConv2DDerInputProgram(convInfo);\n  return  
  backend.runWebGLProgram(program, [dy, filter], 'float32');\n}\n\nexport const  
depthwiseConv2dNativeBackpropInputConfig: KernelConfig = {\n  kernelName:  
  DepthwiseConv2dNativeBackpropInput,\n  backendName: 'webgl',\n  kernelFunc:  
  depthwiseConv2dNativeBackpropInput as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2019 Google  
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { GPGPUProgram } from './gpgpu_math';\n\nexport class DiagProgram implements GPGPUProgram {\n  variableNames = ['X'];\n  outputShape: number[];\n  userCode: string;\n  constructor(size: number) {\n    this.outputShape = [size, size];\n    this.userCode = `\n      void main() {\n        ivec2 coords = getOutputCoords();\n        float val = coords[0] == coords[1] ? getX(coords[0]) : 0.0;\n        setOutput(val);\n      }\n    `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version  
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a  
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { Diag, DiagInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-  
core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { DiagProgram } from  
 './diag_gpu';\nimport { reshape } from './Reshape';\n\nexport function diag(args: { inputs: DiagInputs, backend:  
  MathBackendWebGL }):\n  TensorInfo {\n  const { inputs, backend } = args;\n  const { x } = inputs;\n\n  const  
  outShape = [...x.shape, ...x.shape];\n  const xSize = util.sizeFromShape(x.shape);\n\n  const flat = reshape({ inputs:  
    { x }, backend, attrs: { shape: [xSize] });\n\n  const program = new DiagProgram(xSize);\n  const res =  
  backend.runWebGLProgram(program, [flat], flat.dtype);\n\n  const out = reshape({ inputs: { x: res }, backend, attrs:  
    { shape: outShape });\n\n  backend.disposeIntermediateTensorInfo(flat);\n\n  backend.disposeIntermediateTensorInfo(res);\n\n  return out;\n}\n\nexport const diagConfig: KernelConfig = {\n  kernelName: Diag,\n  backendName: 'webgl',\n  kernelFunc: diag as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
```

"License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Dilation2DProgram implements GPGPUProgram {\n  variableNames = ['x', 'W'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.outShape;\n\n    const {\n      inHeight,\n      inWidth,\n      padInfo,\n      strideHeight,\n      strideWidth,\n      filterHeight,\n      filterWidth,\n      dilationHeight,\n      dilationWidth\n    } = convInfo;\n\n    const {top: padTop, left: padLeft} = padInfo;\n\n    this.userCode = `\n      const ivec2 strides =\n      ivec2(${strideHeight}, ${strideWidth});\n      const ivec2 pads = ivec2(${padTop}, ${padLeft});\n      const float\n      neg_infinity = -3.4e38;\n\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int batch = coords.x;\n        int d1 = coords.w;\n        ivec2 outTopLeftCorner =\n          coords.yz * strides - pads;\n        int hBeg =\n          outTopLeftCorner.x;\n        int wBeg = outTopLeftCorner.y;\n\n        float curVal = neg_infinity;\n        for (int h =\n          0; h < ${filterHeight}; h++) {\n          int hIn = hBeg + h * ${dilationHeight};\n          if (hIn >= 0 && hIn <\n            ${inHeight}) {\n            for (int w = 0; w < ${filterWidth}; w++) {\n              int wIn = wBeg + w *  
${dilationWidth};\n              if (wIn >= 0 && wIn < ${inWidth}) {\n                float xVal = getX(batch, hIn, wIn,  
d1);\n                float wVal = getW(h, w, d1);\n                float val = xVal + wVal;\n                if (val > curVal) {\n                  curVal = val;\n                }\n              }\n            }\n          }\n\n          float result = curVal;\n          setOutput(result);\n        }\n      }\n    `;\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport {backend_util, Dilation2D, Dilation2DAttrs, Dilation2DInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {Dilation2DProgram} from './dilation_gpu';\nimport {reshape} from './Reshape';\n\nexport function dilation2D(args: {\n  inputs: Dilation2DInputs,\n  attrs: Dilation2DAttrs,\n  backend: MathBackendWebGL\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x, filter} = inputs;\n  const {strides, pad, dilations} = attrs;\n\n  const convInfo = backend_util.computeDilation2DInfo(\n    x.shape as [number, number, number, number],\n    filter.shape as [number, number, number],\n    strides, pad,\n    'NHWC' /* dataFormat */,\n    dilations);\n\n  let out: TensorInfo;\n\n  const program = new Dilation2DProgram(convInfo);\n  out =\n    backend.runWebGLProgram(program, [x, filter], 'float32');\n\n  const outReshaped =\n    reshape({inputs: {x: out},\n    backend, attrs: {shape: convInfo.outShape}});\n\n  backend.disposeIntermediateTensorInfo(out);\n\n  return outReshaped;\n}\n\nexport const dilation2DConfig: KernelConfig = {\n  kernelName: Dilation2D,\n  backendName: 'webgl',\n  kernelFunc: dilation2D as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\n
```

```

*\n\nimport {Elu, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst ELU = `return (x >= 0.0) ? x : (exp(x) - 1.0);`;
\n\nconst ELU_PACKED = `
\n  vec4 result;\n\n  result.r = (x.r >= 0.0) ? x.r : (exp(x.r) - 1.0);\n  result.g = (x.g >= 0.0) ? x.g : (exp(x.g) -
1.0);\n  result.b = (x.b >= 0.0) ? x.b : (exp(x.b) - 1.0);\n  result.a = (x.a >= 0.0) ? x.a : (exp(x.a) - 1.0);\n\n  return
result;\n`;
\n\nconst elu = unaryKernelFunc({opSnippet: ELU, packedOpSnippet: ELU_PACKED});\n\nexport const
eluConfig: KernelConfig = {\n  kernelName: Elu,\n  backendName: 'webgl',\n  kernelFunc: elu as {} as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {EluGrad, EluGradInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {BinaryOpProgram} from
'./binaryop_gpu';\nimport {BinaryOpPackedProgram} from './binaryop_packed_gpu';\n\nconst ELU_DER = `return
(b >= 1.0) ? a : a * (b + 1.0);`;
\n\nconst ELU_DER_PACKED = `
\n  vec4 bGTEZero = vec4(greaterThanEqual(b,
vec4(0.)));
\n  return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0))));\n`;
\n\nexport const eluGrad =\n  (args: {inputs: EluGradInputs, backend: MathBackendWebGL}): TensorInfo => {\n    const {inputs,
backend} = args;\n    const {dy, y} = inputs;\n\n    const program =
env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ?\n      new
BinaryOpPackedProgram(ELU_DER_PACKED, dy.shape, y.shape) :
\n      new BinaryOpProgram(ELU_DER,
dy.shape, y.shape);\n    return backend.runWebGLProgram(program, [dy, y], dy.dtype);\n  };\n\nexport const
eluGradConfig: KernelConfig = {\n  kernelName: EluGrad,\n  backendName: 'webgl',\n  kernelFunc: eluGrad as {}
as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {Equal, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst PACKED_EQUAL = `
\n  return vec4(equal(a, b));\n`;
\n\nconst EQUAL = `return float(a == b);`;
\n\nexport const equal = binaryKernelFunc(\n  {opSnippet: EQUAL, packedOpSnippet:
PACKED_EQUAL, dtype: 'bool'});\n\nexport const equalConfig: KernelConfig = {\n  kernelName: Equal,\n  backendName: 'webgl',\n  kernelFunc: equal as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you
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software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util, Erf, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst ERF = `
\n // Error function is calculated approximately with elementary
function.\n // See "Handbook of Mathematical Functions with Formulas,\n // Graphs, and Mathematical Tables",

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Abramowitz and Stegun.\n float p = ${backend_util.ERF_P};\n float a1 = ${backend_util.ERF_A1};\n float a2 =
${backend_util.ERF_A2};\n float a3 = ${backend_util.ERF_A3};\n float a4 = ${backend_util.ERF_A4};\n float
a5 = ${backend_util.ERF_A5};\n\n float sign = sign(x);\n x = abs(x);\n float t = 1.0 / (1.0 + p * x);\n return sign *
(1.0 - (((((a5*t + a4)*t) + a3)*t + a2)*t + a1)*t*exp(-x*x));\n`;\n\nexport const erf = unaryKernelFunc({ opSnippet:
ERF});\n\nexport const erfConfig: KernelConfig = {\n kernelName: Erf,\n backendName: 'webgl',\n kernelFunc:
erf,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reshape} from
'./Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n
backend: MathBackendWebGL\n}): TensorInfo {\n const {inputs, attrs, backend} = args;\n const {dim} = attrs;\n
const {input} = inputs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let
$dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank
+ 1) <= dim,\n () => `Axis must be in the interval [${-(inputRank + 1)}, ${\n inputRank}]);\n $dim =
inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs:
{shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n
backendName: 'webgl',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n", "/**\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class FFTProgram implements GPGPUProgram {\n
variableNames = ['real', 'imag'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n component:
'real'|'imag', inputShape: [number, number],\n inverse: boolean) {\n const innerDim = inputShape[1];\n
this.outputShape = inputShape;\n\n const exponentMultiplierSnippet =\n inverse ? `2.0 * ${Math.PI}` : `-.2.0 *
${Math.PI}`;\n const resultDenominator = inverse ? `${innerDim}.0` : '1.0';\n\n let opString: string;\n if
(component === 'real') {\n opString = 'return real * expR - imag * expI;'\n } else if (component === 'imag') {\n
opString = 'return real * expI + imag * expR;'\n } else {\n throw new Error(\n `FFT component must
be either \"real\" or \"imag\", got ${component}.`);\n }\n\n this.userCode =`\n const float exponentMultiplier
= ${exponentMultiplierSnippet};\n float unaryOpComplex(float real, float expR, float imag, float expI) {\n
${opString}\n }\n\n float mulMatDFT(int batch, int index) {\n float indexRatio = float(index) /
float(${innerDim});\n float exponentMultiplierTimesIndexRatio =\n exponentMultiplier *
indexRatio;\n\n float result = 0.0;\n\n for (int i = 0; i < ${innerDim}; i++) {\n // x = (-2|2 * PI / N) *
index * i;\n float x = exponentMultiplierTimesIndexRatio * float(i);\n float expR = cos(x);\n float
expI = sin(x);\n float real = getReal(batch, i);\n float imag = getImag(batch, i);\n\n result +=\n unaryOpComplex(real, expR, imag, expI) / ${resultDenominator};\n }\n\n return result;\n }\n\n
void main() {\n ivec2 coords = getOutputCoords();\n setOutput(mulMatDFT(coords[0], coords[1]));\n
}\n `;\n }\n}\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

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```
=====
*\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from\n'./backend_webgl';\nimport {FFTProgram} from './fft_gpu';\nimport {complex} from './Complex';\nimport\n{reshape} from './Reshape';\n\nexport function fftImpl(\n  x: TensorInfo, inverse: boolean, backend:\nMathBackendWebGL): TensorInfo {\n  const xData = backend.texData.get(x.dataId);\n\n  const inputSize =\nutil.sizeFromShape(x.shape);\n  // Collapse all outer dimensions to a single batch dimension.\n  const\ninnerDimensionSize = x.shape[x.shape.length - 1];\n  const batch = inputSize / innerDimensionSize;\n\n  const\ninput2D = reshape(\n    {inputs: {x}, backend, attrs: {shape: [batch, innerDimensionSize]}});\n\n  const xShape =\ninput2D.shape as [number, number];\n  const realProgram = new FFTProgram('real', xShape, inverse);\n  const\nimagProgram = new FFTProgram('imag', xShape, inverse);\n\n  const inputs = [\n    {\n      dataId:\nxData.complexTensorInfos.real.dataId,\n      dtype: xData.complexTensorInfos.real.dtype,\n      shape: xShape\n    },\n    {\n      dataId: xData.complexTensorInfos.imag.dataId,\n      dtype: xData.complexTensorInfos.imag.dtype,\n      shape: xShape\n    }\n  ];\n\n  const realPart = backend.runWebGLProgram(realProgram, inputs, 'float32');\n  const\nimagPart = backend.runWebGLProgram(imagProgram, inputs, 'float32');\n\n  const complexOutput =\ncomplex({inputs: {real: realPart, imag: imagPart}, backend});\n\n  backend.disposeIntermediateTensorInfo(realPart);\n  backend.disposeIntermediateTensorInfo(imagPart);\n\n  const\ncomplexOutputReshaped =\n  reshape({inputs: {x: complexOutput}, backend, attrs: {shape: x.shape}});\n\n  backend.disposeIntermediateTensorInfo(input2D);\n  backend.disposeIntermediateTensorInfo(complexOutput);\n\n  return complexOutputReshaped;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in\n * compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */\n\n=====
```

```
*\n\nimport {FFT, FFTInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport\n{MathBackendWebGL} from './backend_webgl';\nimport {fftImpl} from './FFT_impl';\n\nexport function\nfft(args: {inputs: FFTInputs, backend: MathBackendWebGL}):\nTensorInfo {\n  const {inputs, backend} =\nargs;\n  const {input} = inputs;\n\n  return fftImpl(input, false /* inverse */, backend);\n}\n\nexport const fftConfig:\nKernelConfig = {\n  kernelName: FFT,\n  backendName: 'webgl',\n  kernelFunc: fft;\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * \n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */\n\n=====
```

```
*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport\nclass FillProgram implements GPGPUProgram {\n  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n\n  valueLoc: WebGLUniformLocation;\n\n  constructor(shape: number[], value: number) {\n    this.variableNames = ['x'];\n    this.outputShape = shape;\n    this.userCode =`\n    uniform float value;\n    void\n    main() {\n      // Input can be obtained from uniform value.\n      setOutput(value);\n    }\n  `;\n  }\n\n  getCustomSetupFunc(value: number) {\n    return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) =>
```

```
{\n  if (this.valueLoc == null) {\n    this.valueLoc = gpgpu.getUniformLocationNoThrow(webGLProgram,
'value');\n  }\n  gpgpu.gl.uniform1f(this.valueLoc, value);\n  };\n}\n\n", "/*\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {Fill, FillAttrs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {FillProgram} from './fill_gpu';\n\nexport function
fill(args: {backend: MathBackendWebGL, attrs: FillAttrs}): TensorInfo {\n  const {backend, attrs} = args;\n  const
{shape, value} = attrs;\n  let {dtype} = attrs;\n  dtype = dtype || util.inferDtype(value);\n  if (dtype ===
'string') {\n    // String type should be handled in CPU memory.\n    const values = util.getArrayFromDType(dtype,
util.sizeFromShape(shape));\n    values.fill(value as string);\n    return backend.makeTensorInfo(shape, dtype,
values);\n  } else {\n    const program = new FillProgram(shape, value as number);\n    const customSetup =
program.getCustomSetupFunc(value as number);\n    return backend.runWebGLProgram(program, [], dtype,
customSetup);\n  }\n}\n\nexport const fillConfig: KernelConfig = {\n  kernelName: Fill,\n  backendName: 'webgl',\n
kernelFunc: fill as {} as KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class FlipLeftRightProgram implements
GPGPUProgram {\n  variableNames = ['Image'];\n  outputShape: number[] = [];\n  userCode: string;\n  constructor(imageShape: [number, number, number, number]) {\n    const imageWidth = imageShape[2];\n    this.outputShape = imageShape;\n    this.userCode = `\n      void main() {\n        ivec4 coords =
getOutputCoords();\n        int x = coords[2];\n        int coordX = ${imageWidth} - x;\n        float
outputValue;\n        if(coordX >= 0 && coordX < ${imageWidth}) {\n          outputValue = getImage(coords[0],
coords[1], coordX, coords[3]);\n        } else {\n          outputValue = getImage(coords[0], coords[1], coords[2],
coords[3]);\n        }\n        setOutput(outputValue);\n      }\n    `;\n  }\n}\n\n", "/*\n * @license\n * Copyright 2020
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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=====\n
*\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {FlipLeftRight, FlipLeftRightInputs}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport
{FlipLeftRightProgram} from './flip_left_right_gpu';\n\nexport const flipLeftRightConfig: KernelConfig = {\n  kernelName: FlipLeftRight,\n  backendName: 'webgl',\n  kernelFunc: ({inputs, backend}) => {\n    const {image} =
inputs as FlipLeftRightInputs;\n    const webglBackend = backend as MathBackendWebGL;\n    const program =
new FlipLeftRightProgram((image as Tensor4D).shape);\n    const output =
webglBackend.runWebGLProgram(program, [image], image.dtype);\n    return output;\n  };\n};\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

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```
=====\n*\n\nimport {FloorDiv, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\n// We use native integer division to deal with floating point imprecision. Since\n// we implement floor division and glsl implements truncated division, we\n// correct for this by subtracting 1 from result when the result is negative and\n// there is a remainder.\nconst INT_DIV = `float s = sign(a) * sign(b);\nint ia = round(a);\nint ib = round(b);\nif (ib != 0) {\n // Windows (D3D) wants guaranteed non-zero int division at compile-time.\n return float(idiv(ia, ib, s));\n } else {\n return NAN;\n }`;\n\nconst INT_DIV_PACKED = `ivec4 ia = round(a);\nivec4 ib = round(b);\nivec4 cond = notEqual(ib, ivec4(0));\nivec4 result = ivec4(0);\nvec4 s = sign(a) * sign(b);\n\n // Windows (D3D) wants guaranteed non-zero int division at compile-time.\nif (cond[0]) {\n result[0] = idiv(ia[0], ib[0], s[0]);\n }\nif (cond[1]) {\n result[1] = idiv(ia[1], ib[1], s[1]);\n }\nif (cond[2]) {\n result[2] = idiv(ia[2], ib[2], s[2]);\n }\nif (cond[3]) {\n result[3] = idiv(ia[3], ib[3], s[3]);\n }\nreturn vec4(result);`;\n\nexport const floorDiv = binaryKernelFunc({opSnippet: INT_DIV, packedOpSnippet: INT_DIV_PACKED, dtype: 'int32'});\n\nexport const floorDivConfig: KernelConfig = {\n kernelName: FloorDiv,\n backendName: 'webgl',\n kernelFunc: floorDiv as KernelFunc\n};\n`;"`;\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport {getGlslDifferences} from '../glsl_version';\nimport {GPGPUProgram} from '../gpgpu_math';\n\nexport class FromPixelsProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n const [height, width, ] = outputShape;\n this.outputShape = outputShape;\n this.userCode = `void main() {\n ivec3 coords = getOutputCoords();\n int texR = coords[0];\n int texC = coords[1];\n int depth = coords[2];\n vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${width}.0, ${height}.0);\n\n vec4 values = ${glsl.texture2D}(A, uv);\n float value;\n if (depth == 0) {\n value = values.r;\n } else if (depth == 1) {\n value = values.g;\n } else if (depth == 2) {\n value = values.b;\n } else if (depth == 3) {\n value = values.a;\n }\n\n setOutput(floor(value * 255.0 + 0.5));\n }\n `;\n }\n\n`;\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {getGlslDifferences} from '../glsl_version';\nimport {GPGPUProgram} from '../gpgpu_math';\n\nexport class FromPixelsPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = false;\n packedOutput = true;\n\n constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n const [height, width, ] =
```

```

outputShape;\n  this.outputShape = outputShape;\n  this.userCode = `
  void main() {\n    ivec3 coords =
getOutputCoords();\n    int texR = coords[0];\n    int texC = coords[1];\n    int depth = coords[2];\n\n    vec4 result = vec4(0.);\n    for(int row=0; row<=1; row++) {\n      for(int col=0; col<=1; col++) {\n
texC = coords[1] + row;\n        depth = coords[2] + col;\n\n        vec2 uv = (vec2(texC, texR) + halfCR) /\n          vec2(${width}.0, ${height}.0);\n        vec4 values = ${gls!.texture2D}(A, uv);\n        float value;\n
if (depth == 0) {\n          value = values.r;\n        } else if (depth == 1) {\n          value = values.g;\n        }
else if (depth == 2) {\n          value = values.b;\n        } else if (depth == 3) {\n          value = values.a;\n
}\n\n        result[row * 2 + col] = floor(value * 255.0 + 0.5);\n      }\n    }\n\n    ${gls!.output} = result;\n
}\n  `;\n  }\n}\n",`

```

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```

=====
*\n\nimport {env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {FromPixels,
FromPixelsAttrs, FromPixelsInputs} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from
'./backend_webgl';\nimport {TextureUsage} from './tex_util';\n\nimport {FromPixelsProgram} from
'./FromPixels_utils/from_pixels_gpu';\nimport {FromPixelsPackedProgram} from
'./FromPixels_utils/from_pixels_packed_gpu';\n\nexport const fromPixelsConfig: KernelConfig = {\n  kernelName:
FromPixels,\n  backendName: 'webgl',\n  kernelFunc: fromPixels as { } as KernelFunc,\n};\n\nlet
fromPixels2DContext: CanvasRenderingContext2D;\n\nfunction fromPixels(args: {\n  inputs: FromPixelsInputs,\n  backend: MathBackendWebGL,\n  attrs: FromPixelsAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  let {pixels} = inputs;\n  const {numChannels} = attrs;\n\n  const isVideo = typeof (HTMLVideoElement)
!=='undefined' &&\n    pixels instanceof HTMLVideoElement;\n  const isImage = typeof (HTMLImageElement)
!=='undefined' &&\n    pixels instanceof HTMLImageElement;\n  const isImageBitmap = typeof (ImageBitmap)
!=='undefined' &&\n    pixels instanceof ImageBitmap;\n  const [width, height] = isVideo ?\n    [\n      (pixels as HTMLVideoElement).videoWidth,\n      (pixels as HTMLVideoElement).videoHeight\n    ]:\n    [pixels.width,
pixels.height];\n\n  const texShape: [number, number] = [height, width];\n  const outShape = [height, width,
numChannels];\n\n  if (isImage || isVideo || isImageBitmap) {\n    if (fromPixels2DContext == null) {\n
fromPixels2DContext = document.createElement('canvas').getContext('2d');\n    }\n\n    fromPixels2DContext.canvas.width = width;\n    fromPixels2DContext.canvas.height = height;\n
fromPixels2DContext.drawImage(\n      pixels as HTMLVideoElement | HTMLImageElement | ImageBitmap,\n      0, 0, width, height);\n    pixels = fromPixels2DContext.canvas;\n  }\n\n  const tempPixelHandle =
backend.makeTensorInfo(texShape, 'int32');\n  // This is a byte texture with pixels.\n  backend.texData.get(tempPixelHandle.dataId).usage = TextureUsage.PIXELS;\n
backend.gpgpu.uploadPixelDataToTexture(\n  backend.getTexture(tempPixelHandle.dataId), pixels as
ImageData);\n  const program = env().getBool('WEBGL_PACK') ?\n    new FromPixelsPackedProgram(outShape)
:\n    new FromPixelsProgram(outShape);\n  const res = backend.runWebGLProgram(program, [tempPixelHandle],
'int32');\n  backend.disposeData(tempPixelHandle.dataId);\n  return res;\n}\n",`

```

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```

*\n\nimport { backend_util, env, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig,
KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from
'./backend_webgl';\n\nimport { Conv2DProgram } from './conv_gpu';\n\nimport { mapActivationToShaderProgram }
from './kernel_utils/kernel_funcs_utils';\n\nimport { conv2dByMatMul, conv2dWithIm2Row } from
'./Conv2D_impl';\n\nimport { reshape } from './Reshape';\n\n\nexport function fusedConv2d(args: {\n inputs:
FusedConv2DInputs,\n attrs: FusedConv2DAttrs,\n backend: MathBackendWebGL\n}) {\n const { inputs,
backend, attrs } = args;\n const { x, filter, bias, preluActivationWeights } = inputs;\n const {\n strides,\n pad,\n dataFormat,\n dilations,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const
$dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo =
backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number],\n filter.shape as
[number, number, number, number], strides, dilations, pad,\n dimRoundingMode, false /* depthwise */,
$dataFormat);\n let out: TensorInfo;\n const intermediates: TensorInfo[] = [];\n\n if (convInfo.filterHeight === 1
&& convInfo.filterWidth === 1 &&\n convInfo.dilationHeight === 1 && convInfo.dilationWidth === 1 &&\n
convInfo.strideHeight === 1 && convInfo.strideWidth === 1 &&\n (convInfo.padInfo.type === 'SAME' ||
convInfo.padInfo.type === 'VALID')) {\n out = conv2dByMatMul({\n x,\n filter,\n convInfo,\n
backend,\n bias,\n activation,\n preluActivationWeights,\n leakyreluAlpha\n });\n } else if
(env().getBool('WEBGL_CONV_IM2COL') && x.shape[0] === 1) {\n out = conv2dWithIm2Row({\n x,\n
filter,\n convInfo,\n backend,\n bias,\n activation,\n preluActivationWeights,\n leakyreluAlpha\n
});\n } else {\n const hasBias = bias != null;\n const hasPreluActivationWeights = preluActivationWeights !=
null;\n const hasLeakyreluAlpha = activation === 'leakyrelu';\n const fusedActivation =\n activation ?
mapActivationToShaderProgram(activation, false) : null;\n const program = new Conv2DProgram(\n
convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n hasLeakyreluAlpha);\n const inputs:
TensorInfo[] = [x, filter];\n if (bias) {\n inputs.push(bias);\n }\n if (preluActivationWeights) {\n
inputs.push(preluActivationWeights);\n }\n if (hasLeakyreluAlpha) {\n const $leakyreluAlpha =
backend.makeTensorInfo(\n [], 'float32',\n util.createScalarValue(leakyreluAlpha as { } as 'float32',
'float32'));\n inputs.push($leakyreluAlpha);\n intermediates.push($leakyreluAlpha);\n }\n out =
backend.runWebGLProgram(program, inputs, 'float32');\n }\n\n const outReshaped =\n reshape({ inputs: {x:
out}, backend, attrs: {shape: convInfo.outShape}});\n\n intermediates.push(out);\n intermediates.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n\n return outReshaped;\n }\n\n\nexport const fusedConv2DConfig:
KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'webgl',\n kernelFunc: fusedConv2d as { } as
KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
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```

```

=====\n
*\n\nimport { backend_util, env, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, TensorInfo, util } from '@tensorflow/tfjs-
core';\n\nimport { MathBackendWebGL } from './backend_webgl';\n\nimport { DepthwiseConv2DProgram } from
'./conv_gpu_depthwise';\n\nimport { DepthwiseConvPacked2DProgram } from
'./conv_packed_gpu_depthwise';\n\nimport { mapActivationToShaderProgram } from
'./kernel_utils/kernel_funcs_utils';\n\n\nexport function fusedDepthwiseConv2D(args: {\n inputs:
FusedDepthwiseConv2DInputs,\n attrs: FusedDepthwiseConv2DAttrs,\n backend: MathBackendWebGL\n}) {\n
const { inputs, backend, attrs } = args;\n const { x, filter, bias, preluActivationWeights } = inputs;\n
const { strides,
pad, dilations, dimRoundingMode, activation, leakyreluAlpha } =\n attrs;\n\n const intermediates: TensorInfo[] =
[];\n\n let $dilations = dilations;\n if ($dilations == null) {\n $dilations = [1, 1];\n }\n\n util.assert(\n

```

```

backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n    () => 'Error in depthwiseConv2d: Either
strides or dilations must be '+\n        `1. Got strides ${strides} and dilations '${dilations}');\n\n const convInfo =
backend_util.computeConv2DInfo(\n    x.shape as [number, number, number, number],\n    filter.shape as
[number, number, number, number], strides, $dilations,\n    pad, dimRoundingMode, true /* depthwise */);\n\n
const shouldPackDepthwiseConv = env().getBool('WEBGL_PACK_DEPTHWISECONV') &&\n
convInfo.strideWidth <= 2 &&\n    convInfo.outChannels / convInfo.inChannels === 1;\n const fusedActivation =
activation ?\n    mapActivationToShaderProgram(activation, shouldPackDepthwiseConv) :\n    null;\n const
programInputs: TensorInfo[] = [x, filter];\n\n const hasBias = bias != null;\n const hasPreluActivationWeights =
preluActivationWeights != null;\n const hasLeakyreluAlpha = activation === 'leakyrelu';\n\n if (hasBias) {\n
programInputs.push(bias);\n } \n if (hasPreluActivationWeights) {\n
programInputs.push(preluActivationWeights);\n } \n if (hasLeakyreluAlpha) {\n    const $leakyreluAlpha =
backend.makeTensorInfo(\n        [], 'float32',\n        util.createScalarValue(leakyreluAlpha as {} as 'float32',
'float32'));\n    programInputs.push($leakyreluAlpha);\n    intermediates.push($leakyreluAlpha);\n } \n\n let
program: DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n if (shouldPackDepthwiseConv) {\n
program = new DepthwiseConvPacked2DProgram(\n    convInfo, hasBias, fusedActivation,
hasPreluActivationWeights,\n    hasLeakyreluAlpha);\n } else {\n    program = new
DepthwiseConv2DProgram(\n    convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n
hasLeakyreluAlpha);\n } \n\n const result = backend.runWebGLProgram(program, programInputs, 'float32');\n\n
intermediates.forEach(t => backend.disposeIntermediateTensorInfo(t));\n return result;\n } \n\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n    kernelName: FusedDepthwiseConv2D,\n    backendName:
'webgl',\n    kernelFunc: fusedDepthwiseConv2D as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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=====\n
*\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'/shader_compiler';\n\nexport class GatherNDProgram implements GPGPUProgram {\n    variableNames = ['x',
"indices'];\n    outputShape: number[];\n    userCode: string;\n    constructor(\n        private sliceDim: number, private
strides: number[], shape: number[]) {\n        this.outputShape = shape;\n        const stridesType =
getCoordsDataType(strides.length);\n        const dtype = getCoordsDataType(shape.length);\n        const strideString =
this.sliceDim > 1 ? 'strides[j]' : 'strides';\n        this.userCode = `\n            ${stridesType} strides =
${stridesType}(${this.strides});\n            void main() {\n                ${dtype} coords = getOutputCoords();\n                int
flattenIndex = 0;\n                for (int j = 0; j < ${this.sliceDim}; j++) {\n                    int index = round(getIndices(coords[0],
j));\n                    flattenIndex += index * ${strideString};\n                }\n                setOutput(getX(flattenIndex, coords[1]));\n
            }\n        `;\n    }\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {backend_util, GatherNd, GatherNdInputs, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {GatherNDProgram}
from './gather_nd_gpu';\nimport {reshape} from './Reshape';\n\nexport function gatherNd(\n    args: {inputs:

```

```
GatherNdInputs, backend: MathBackendWebGL}): TensorInfo {\n  const {inputs, backend} = args;\n  const {params, indices} = inputs;\n  const indicesShape = indices.shape;\n  const sliceRank = indicesShape[indicesShape.length - 1];\n  const [resultShape, numSlices, sliceSize, strides] =\n  backend_util.prepareAndValidate(params, indices);\n  const flattenIndices = reshape(\n    {inputs: {x: indices},\n    backend, attrs: {shape: [numSlices, sliceRank]}});\n  const flattenX = reshape({\n    inputs: {x: params},\n    backend,\n    attrs: {shape: [(util.sizeFromShape(params.shape) / sliceSize), sliceSize]}\n  });\n  const program =\n    new GatherNDProgram(sliceRank, strides, [numSlices, sliceSize]);\n  const res = backend.runWebGLProgram(\n    program, [flattenX, flattenIndices], flattenX.dtype);\n  const reshaped =\n    reshape({inputs: {x: res}, backend,\n    attrs: {shape: resultShape}});\n  backend.disposeIntermediateTensorInfo(flattenIndices);\n  backend.disposeIntermediateTensorInfo(flattenX);\n  backend.disposeIntermediateTensorInfo(res);\n  return reshaped;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n  kernelName: GatherNd,\n  backendName: 'webgl',\n  kernelFunc: gatherNd as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class GatherProgram implements GPGPUProgram {\n  variableNames = ['A', 'indices'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  constructor(aShape: number[], outputShape: number[]) {\n    this.outputShape = outputShape;\n    this.rank = outputShape.length;\n    const dtype = getCoordsDataType(this.rank);\n    const sourceCoords = getSourceCoords(aShape, 2);\n    this.userCode = `\nvoid main() {\n  ${dtype} resRC = getOutputCoords();\n  setOutput(getA(${sourceCoords}));\n}\n`;\n\n  }\n\n  // The input and output are always flattened into rank 4 tensors.\n  function getSourceCoords(aShape: number[], axis: number): string {\n    const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n    const sourceCoords = [];\n    for (let i = 0; i < aShape.length; i++) {\n      if (i === 2) {\n        sourceCoords.push(`int(getIndices(resRC.x, resRC.z))`);\n      } else {\n        sourceCoords.push(`${currentCoords[i]}`);\n      }\n    }\n    return sourceCoords.join();\n  }\n\n  "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {GatherProgram} from './gather_gpu';\nimport {gatherV2ImplCPU} from './kernel_utils/shared';\nimport {reshape} from './Reshape';\n\nexport function gatherV2(args: {\n  inputs: GatherV2Inputs,\n  backend: MathBackendWebGL,\n  attrs: GatherV2Attrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x, indices} = inputs;\n  const {axis, batchDims} = attrs;\n  const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n  const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n    x, indices, parsedAxis, batchDims);\n  const indicesSize = util.sizeFromShape(indices.shape);\n  const toDispose = [];\n  const flattenX = reshape({\n    inputs: {x},\n    backend,\n    attrs: {\n      shape: [\n        shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n        shapeInfo.sliceSize\n      ]\n    }\n  });\n  const flattenIndex = reshape({\n    inputs: {x: indices},\n    backend,\n    attrs: {shape: [shapeInfo.batchSize, indicesSize /
```

```

shapeInfo.batchSize}}\n });\n\n toDispose.push(flattenX);\n toDispose.push(flattenIndex);\n\n const
flattenOutputShape = [\n  shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n
shapeInfo.sliceSize\n ];\n\n if (backend.shouldExecuteOnCPU([x, indices]) || x.dtype === 'string') {\n  const
indicesBuf = backend.bufferSync(flattenIndex);\n  const xBuf = backend.bufferSync(flattenX);\n  const outBuf =
gatherV2ImplCPU(xBuf, indicesBuf, flattenOutputShape);\n\n  toDispose.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n\n  return backend.makeTensorInfo(\n    shapeInfo.outputShape,
outBuf.dtype, outBuf.values as TypedArray);\n  }\n\n  const program = new GatherProgram(flattenX.shape,
flattenOutputShape);\n  const res = backend.runWebGLProgram(\n    program, [flattenX, flattenIndex],
flattenX.dtype);\n  toDispose.push(res);\n\n  const reshaped = reshape(\n    {inputs: {x: res}, backend, attrs:
{shape: shapeInfo.outputShape}});\n  toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n  return
reshaped;\n}\n\nexport const gatherV2Config: KernelConfig = {\n  kernelName: GatherV2,\n  backendName:
'webgl',\n  kernelFunc: gatherV2 as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====\n
*\n\nimport {GreaterEqual, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}
from './kernel_utils/kernel_funcs_utils';\n\nconst GREATER_EQUAL = `return float(a >= b);`; \nconst
GREATER_EQUAL_PACKED = `\n  return vec4(greaterThanEqual(a, b));\n`; \n\nexport const greaterEqual =
binaryKernelFunc({\n  opSnippet: GREATER_EQUAL,\n  packedOpSnippet: GREATER_EQUAL_PACKED,\n
dtype: 'bool'\n});\n\nexport const greaterEqualConfig: KernelConfig = {\n  kernelName: GreaterEqual,\n
backendName: 'webgl',\n  kernelFunc: greaterEqual as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright
2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====\n
*\n\nimport {IFFT, IFFTInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\nimport
{MathBackendWebGL} from './backend_webgl';\nimport {fftImpl} from './FFT_impl';\n\nexport function
ifft(args: {inputs: IFFTInputs, backend: MathBackendWebGL}):\n  TensorInfo {\n  const {inputs, backend} =
args;\n  const {input} = inputs;\n\n  return fftImpl(input, true /* inverse */, backend);\n}\n\nexport const ifftConfig:
KernelConfig = {\n  kernelName: IFFT,\n  backendName: 'webgl',\n  kernelFunc: ifft\n};\n", "/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {IsFinite, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst IS_FINITE = `return float(!isnan(x) && !isinf(x));`; \n\nexport const
isFinite = unaryKernelFunc({opSnippet: IS_FINITE, dtype: 'bool'});\n\nexport const isFiniteConfig: KernelConfig
= {\n  kernelName: IsFinite,\n  backendName: 'webgl',\n  kernelFunc: isFinite\n};\n", "/*\n * @license\n *

```

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* distributed under the License is distributed on an "AS IS" BASIS,
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
* See the License for
the specific language governing permissions and
* limitations under the License.

```
=====  
*\n\nimport {IsInf, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from  
 './kernel_utils/kernel_funcs_utils';\n\nconst IS_INF = `return float(isinf(x));`;\n\nexport const isInf =  
 unaryKernelFunc({opSnippet: IS_INF, dtype: 'bool'});\n\nexport const isInfConfig: KernelConfig = {\n  kernelName: IsInf,\n  backendName: 'webgl',\n  kernelFunc: isInf,\n};\n"/**\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
 * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {IsNan, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from  
 './kernel_utils/kernel_funcs_utils';\n\nconst IS_NAN = `return float(isnan(x));`;\n\nexport const isNaN =  
 unaryKernelFunc({opSnippet: IS_NAN, dtype: 'bool'});\n\nexport const isNaNConfig: KernelConfig = {\n  kernelName: IsNan,\n  backendName: 'webgl',\n  kernelFunc: isNaN,\n};\n"/**\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
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```

```
=====  
*\n\nimport {KernelConfig, KernelFunc, LessEqual} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}  
 from './kernel_utils/kernel_funcs_utils';\n\nexport const LESS_EQUAL = `return float(a <= b);`;\n\nexport const  
 LESS_EQUAL_PACKED = `\n  return vec4(lessThanEqual(a, b));`\n;\n\nexport const lessEqual =  
 binaryKernelFunc(\n  {opSnippet: LESS_EQUAL, packedOpSnippet: LESS_EQUAL_PACKED, dtype:  
 'bool'});\n\nexport const lessEqualConfig: KernelConfig = {\n  kernelName: LessEqual,\n  backendName: 'webgl',\n  kernelFunc: lessEqual as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights  
 Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file  
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 * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
 governing permissions and\n * limitations under the License.\n */
```

```
=====  
*\n\nimport {KernelConfig, KernelFunc, LinSpace, LinSpaceAttrs, TensorInfo} from '@tensorflow/tfjs-  
core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {linSpaceImplCPU} from  
 './kernel_utils/shared';\n\nexport function linSpace(\n  args: {backend: MathBackendWebGL, attrs:  
 LinSpaceAttrs}): TensorInfo {\n  const {backend, attrs} = args;\n  const {start, stop, num} = attrs;\n  // TODO:  
 Use CPU implementation due to the precision problem in Safari.\n  const outVals = linSpaceImplCPU(start, stop,  
 num);\n  return backend.makeTensorInfo([outVals.length, 'float32', outVals]);\n}\n\nexport const linSpaceConfig:
```

KernelConfig = {\n kernelName: LinSpace,\n backendName: 'webgl',\n kernelFunc: linSpace as { } as
KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```
=====\n*\n\nimport {KernelConfig, Log1p} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from  
 './kernel_utils/kernel_funcs_utils';\n\nconst LOG1P = `return log(1.0 + x);`;\n\nexport const log1p =  
unaryKernelFunc({opSnippet: LOG1P});\n\nexport const log1pConfig: KernelConfig = {\n  kernelName: Log1p,\n  backendName: 'webgl',\n  kernelFunc: log1p,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights  
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file  
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *  
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, LogicalAnd} from '@tensorflow/tfjs-core';\nimport  
{binaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_AND = `return float(a >= 1.0 &&  
b >= 1.0);`;\n\nconst LOGICAL_AND_PACKED = `\n  return vec4(\n    vec4(greaterThanEqual(a, vec4(1.0))) *\n    vec4(greaterThanEqual(b, vec4(1.0)))\n  );`;\n\nexport const logicalAnd = binaryKernelFunc({\n  opSnippet:  
LOGICAL_AND,\n  packedOpSnippet: LOGICAL_AND_PACKED,\n  dtype: 'bool'\n});\n\nexport const  
logicalAndConfig: KernelConfig = {\n  kernelName: LogicalAnd,\n  backendName: 'webgl',\n  kernelFunc:  
logicalAnd as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in  
compliance with the License.\n * You may obtain a copy of the License at\n * \n *  
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,  
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES  
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language  
governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, LogicalNot} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from  
 './kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_NOT = `return float(!(x >= 1.0));`;\n\nexport const  
logicalNot = unaryKernelFunc({opSnippet: LOGICAL_NOT});\n\nexport const logicalNotConfig: KernelConfig =  
{\n  kernelName: LogicalNot,\n  backendName: 'webgl',\n  kernelFunc: logicalNot,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the  
 \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the  
License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or  
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *  
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  
the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport {KernelConfig, KernelFunc, LogicalOr} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc}  
from './kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_OR = `return float(a >= 1.0 || b >= 1.0);`;\n\nconst  
LOGICAL_OR_PACKED = `\n  return min(\n    vec4(greaterThanEqual(a, vec4(1.0))) +\n
```

```

vec4(greaterThanEqual(b, vec4(1.0)),\n  vec4(1.0));\n`;\n\nexport const logicalOr = binaryKernelFunc(\n  {opSnippet: LOGICAL_OR, packedOpSnippet: LOGICAL_OR_PACKED, dtype: 'bool'});\n\nexport const\n  logicalOrConfig: KernelConfig = {\n    kernelName: LogicalOr,\n    backendName: 'webgl',\n    kernelFunc: logicalOr\n  } as KernelFunc\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed\n * under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n * License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n * on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n * implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n * License.\n *

```

```

=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNProgram implements GPGPUProgram\n  {\n    variableNames = ['x'];\n    outputShape: number[] = [];\n    userCode: string;\n\n    constructor(\n      xShape:\n        number[], radius: number, bias: number, alpha: number,\n        beta: number) {\n      const rad = radius;\n      const\n        maxD = xShape[3] - 1;\n      this.outputShape = xShape;\n\n      // optimize pow(bias + alpha * sum, -beta)\n      // src:\n      https://github.com/tensorflow/tensorflow/..\n      // blob/26033a1644a9c4a5f3170ab2e864b6a4ccd4ca/..\n      //\n      tensorflow/core/kernels/mkl_lrn_op.cc#L320\n      let powOperator;\n      const basis = `float(${bias}) +\n        float(${alpha}) * sum`;\n      if (beta === 0.5) {\n        powOperator = `inversesqrt(${basis})`;\n      } else if (beta ===\n        1.0) {\n        powOperator = `1.0/(${basis})`;\n      } else {\n        powOperator = `exp(log(${basis}) * float(-\n          ${beta}))`;\n      }\n      this.userCode = `\n        void main() {\n          ivec4 coords = getOutputCoords();\n          int b =\n            coords[0];\n          int r = coords[1];\n          int c = coords[2];\n          int d = coords[3];\n          float x = getX(b, r, c, d);\n          float sum = 0.0;\n          for (int j = -${rad}; j <= ${rad}; j++) {\n            int idx = d + j;\n            if (idx >= 0 && idx\n              <= ${maxD}) {\n              float z = getX(b, r, c, idx);\n              sum += z * z;\n            }\n          }\n          float val = x *\n            ${powOperator};\n          setOutput(val);\n        }\n      `;\n    }\n  }\n"/**\n * @license\n * Copyright 2019 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNPackedProgram implements\n  GPGPUProgram {\n    variableNames = ['x'];\n    outputShape: number[] = [];\n    userCode: string;\n    packedInputs =\n      true;\n    packedOutput =\n      true;\n\n    constructor(\n      xShape: number[], radius: number, bias: number, alpha:\n        number,\n        beta: number) {\n      const rad = radius;\n      const maxD = xShape[3] - 1;\n      this.outputShape =\n        xShape;\n\n      // optimize pow(bias + alpha * sum, -beta)\n      // src: https://github.com/tensorflow/tensorflow/..\n      // blob/26033a1644a9c4a5f3170ab2e864b6a4ccd4ca/..\n      // tensorflow/core/kernels/mkl_lrn_op.cc#L320\n      let\n        powOperator;\n      const basis = `float(${bias}) + float(${alpha}) * sum`;\n      if (beta === 0.5) {\n        powOperator =\n          `inversesqrt(${basis})`;\n      } else if (beta === 1.0) {\n        powOperator =\n          `1.0/(${basis})`;\n      } else {\n        powOperator =\n          `exp(log(${basis}) * float(-${beta}))`;\n      }\n      this.userCode = `\n        void main() {\n          ivec4\n            coords = getOutputCoords();\n          int b = coords.x;\n          int r = coords.y;\n          int c = coords.z;\n          int d =\n            coords.w;\n          bool hasNextCol = d < ${this.outputShape[3]};\n          bool hasNextRow = c <\n            ${this.outputShape[2]};\n          vec4 sum = vec4(0.);\n          vec4 xFragAtOutputCoords = getX(b, r, c, d);\n          vec4\n            xAtOutputCoords = vec4(\n              getChannel(xFragAtOutputCoords, vec2(c, d)),\n              hasNextCol ?\n                getChannel(xFragAtOutputCoords, vec2(c, d + 1)) : 0.0,\n              hasNextRow ?\n                getChannel(xFragAtOutputCoords, vec2(c + 1, d)) : 0.0,\n              (hasNextRow && hasNextCol) ?\n                getChannel(xFragAtOutputCoords, vec2(c + 1, d + 1)) : 0.0\n            );\n          int firstChannel = d - ${rad};\n          vec2 cache = vec2(0.);\n          if (firstChannel >= 0) {\n            vec4 firstChannelFrag = getX(b, r, c, firstChannel);\n          }\n        }\n      `;\n    }\n  }\n"/**\n * @license\n * Copyright 2019 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *

```

```

cache.x = getChannel(firstChannelFrag, vec2(c, firstChannel));\n        if(hasNextRow){\n            cache.y =
getChannel(firstChannelFrag, vec2(c + 1, firstChannel));\n        }\n    }\n    ivec2 depth = ivec2(d, d + 1);\n    for (int j = - ${rad}; j <= ${rad}; j++) {\n        ivec2 idx = depth + j;\n        bvec2 aboveLowerBound =
greaterThanEqual(idx, ivec2(0));\n        bvec2 belowUpperBound = lessThanEqual(idx, ivec2(${maxD}));\n        bool depthInRange = aboveLowerBound.x && belowUpperBound.x;\n        bool depthPlusOneInRange =
aboveLowerBound.y && belowUpperBound.y;\n        if(depthInRange || depthPlusOneInRange){\n            vec4 z
= vec4(0);\n            vec4 xFragAtCurrentDepth;\n            z.xz = cache.xy;\n            if(depthPlusOneInRange &&
hasNextCol){\n                xFragAtCurrentDepth = idx.y != d ?\n                    getX(b, r, c, idx.y) :
xFragAtOutputCoords;\n                z.y = getChannel(xFragAtCurrentDepth, vec2(c, idx.y));\n            }\n            if(hasNextRow){\n                z.w = getChannel(xFragAtCurrentDepth, vec2(c + 1, idx.y));\n            }\n            cache.xy = z.yw;\n            sum += z * z;\n        }\n    }\n    vec4 result = xAtOutputCoords *
${powOperator};\n    setOutput(result);\n }\n\n`;\n}\n}\n\n",/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====\n
*/\n\nimport {env, KernelConfig, KernelFunc, LRN, LRNAttrs, LRNInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {LRNProgram} from
'../lrn_gpu';\n\nimport {LRNPackedProgram} from '../lrn_packed_gpu';\n\n\nexport const lrn =\n (args: {inputs:
LRNInputs, backend: MathBackendWebGL, attrs: LRNAttrs}):\n    TensorInfo => {\n        const {inputs,
backend, attrs} = args;\n        const {x} = inputs;\n        const {depthRadius, bias, alpha, beta} = attrs;\n\n        const program = env().getBool('WEBGL_PACK_NORMALIZATION') ?\n            new
LRNPackedProgram(x.shape, depthRadius, bias, alpha, beta) :\n            new LRNProgram(x.shape, depthRadius,
bias, alpha, beta);\n        return backend.runWebGLProgram(program, [x], x.dtype);\n    };\n\n// tslint:disable-
next-line: variable-name\n\nexport const LRNConfig: KernelConfig = {\n    kernelName: LRN,\n    backendName:
'webgl',\n    kernelFunc: lrn as { } as KernelFunc\n};\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNGradProgram implements
GPGPUProgram {\n    variableNames = ['inputImage', 'outputImage', 'dy'];\n    outputShape: number[] = [];\n    userCode: string;\n    depthRadius: number;\n    bias: number;\n    alpha: number;\n    beta: number;\n    depth: number;\n\n    constructor(\n        inputShape: number[], depthRadius: number, bias: number, alpha: number,\n        beta: number) {\n        this.outputShape = inputShape;\n        this.depth = inputShape[3];\n        this.depthRadius = depthRadius;\n        this.bias =
bias;\n        this.alpha = alpha;\n        this.beta = beta;\n        this.userCode =`\n            void main() {\n                ivec4 coords =
getOutputCoords();\n                int b = coords[0];\n                int r = coords[1];\n                int c = coords[2];\n\n                float result =
0.0;\n                for (int d = 0; d < ${this.depth}; ++d) {\n                    int depthBegin = int(max(0.0, float(d -
${depthRadius}));\n                    int depthEnd = int(min(float(${this.depth}),\n                        float(d + ${depthRadius} +
1)));\n\n                    const int MIN_DEPTH_BEGIN = 0;\n                    const int MAX_DEPTH_END = ${this.depth};\n\n                    float norm = 0.0;\n                    for (int k = MIN_DEPTH_BEGIN; k < MAX_DEPTH_END; ++k) {\n                        if (k <
depthBegin){\n                            continue;\n                        }\n                        else if (k >= depthBegin && k < depthEnd) {\n                            norm

```



```

+= getInputImage(b, r, c, k) * getInputImage(b, r, c, k);\n        }\n        else {\n            break;\n        }\n    }\n    norm = float(${alpha}) * norm + float(${bias});\n    for(int k = MIN_DEPTH_BEGIN; k <
MAX_DEPTH_END; ++k){\n        if (k < depthBegin){\n            continue;\n        }\n        else if (k >=
depthBegin && k < depthEnd){\n            float dyi = -2.0 * float(${alpha})\n                * float(${beta})\n            *\n            getInputImage(b, r, c, k) * getOutputImage(b, r, c, d)\n                / norm;\n            if (k == d) {\n                dyi +=
pow(norm, -1.0 * ${beta});\n            }\n            if (k == coords[3]) {\n                dyi *= getDy(b, r, c, d);\n            }\n            result += dyi;\n        }\n    }\n    else {\n        break;\n    }\n}\n}\n
setOutput(result);\n    }\n    `;\n}\n}\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelConfig, KernelFunc, LRNGrad, LRNGradAttrs, LRNGradInputs, TensorInfo } from
'@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { LRNGradProgram }
from '../lrn_grad_gpu';\n\nexport const lrnGrad = (args: {\n  inputs: LRNGradInputs,\n  backend:
MathBackendWebGL,\n  attrs: LRNGradAttrs\n}): TensorInfo => {\n  const {inputs, backend, attrs} = args;\n  const
{x, y, dy} = inputs;\n  const {depthRadius, bias, alpha, beta} = attrs;\n\n  const program = new
LRNGradProgram(x.shape, depthRadius, bias, alpha, beta);\n  return backend.runWebGLProgram(program, [x, y,
dy], x.dtype);\n};\n\n// tslint:disable-next-line: variable-name\nexport const LRNGradConfig: KernelConfig = {\n
kernelName: LRNGrad,\n  backendName: 'webgl',\n  kernelFunc: lrnGrad as {} as KernelFunc\n};\n", "/*\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport { KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport
{ backend_util, KernelConfig, TypedArray, util } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL }
from '../backend_webgl';\nimport { maxImplCPU } from '../kernel_utils/shared';\nimport { maxImpl } from
'./Max_impl';\nimport { transposeImpl, transposeImplCPU } from './Transpose_impl';\n\nexport function max(\n
args: {\n  inputs: MaxInputs,\n  backend: MathBackendWebGL,\n  attrs: MaxAttrs\n}): TensorInfo {\n  const {inputs,
backend, attrs} = args;\n  const {x} = inputs;\n  const {reductionIndices, keepDims} = attrs;\n\n  const xRank =
x.shape.length;\n  const origAxes = util.parseAxisParam(reductionIndices, x.shape);\n  let axes = origAxes;\n  const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n  const maxInputIsTransposed =
permutedAxes != null;\n  const shouldExecuteOnCPU = backend.shouldExecuteOnCPU([x]);\n\n  let maxInput =
x;\n  if (maxInputIsTransposed) {\n    if (shouldExecuteOnCPU) {\n      const xTexData =
backend.texData.get(maxInput.dataId);\n      const values = xTexData.values as TypedArray;\n\n      const
newShape: number[] = new Array(xRank);\n      for (let i = 0; i < newShape.length; i++) {\n        newShape[i] =
x.shape[permutedAxes[i]];\n      }\n      const maxInputValues =\n        transposeImplCPU(values, x.shape, x.dtype,
permutedAxes, newShape);\n\n      maxInput = backend.makeTensorInfo(newShape, x.dtype);\n      const
maxInputData = backend.texData.get(maxInput.dataId);\n      maxInputData.values = maxInputValues;\n    } else
{\n      maxInput = transposeImpl(x, permutedAxes, backend);\n    }\n  }\n  axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n  backend_util.assertAxesAreInnerMostDims('max',
axes, xRank);\n  const [maxOutShape, reduceShape] =\n

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backend_util.computeOutAndReduceShapes(maxInput.shape, axes);\n\n let outShape = maxOutShape;\n if
(keepDims) {\n // rather than reshape at the end, set the target shape here.\n outShape =
backend_util.expandShapeToKeepDim(maxOutShape, origAxes);\n }\n\n let out;\n if (shouldExecuteOnCPU) {\n
const xTexData = backend.texData.get(maxInput.dataId);\n const values = xTexData.values as TypedArray;\n\n
const outValues =\n maxImplCPU(values, util.sizeFromShape(reduceShape), outShape, x.dtype);\n\n out =
backend.makeTensorInfo(outShape, x.dtype);\n const outData = backend.texData.get(out.dataId);\n
outData.values = outValues;\n } else {\n out = maxImpl(maxInput, reduceShape, outShape, backend);\n }\n\n if
(maxInputIsTransposed) {\n backend.disposeIntermediateTensorInfo(maxInput);\n }\n\n return out;\n}\n\nexport
const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'webgl',\n kernelFunc: max as {} as
KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from
'/Identity';\n\nexport function maxPool(args: {\n inputs: MaxPoolInputs,\n backend: MathBackendWebGL,\n
attrs: MaxPoolAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n
assertNotComplex(x, 'maxPool');\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const dilations =
1;\n\n util.assert(\n backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => 'Error in
maxPool: Either strides or dilations must be 1. ' +\n `Got strides ${strides} and dilations ${dilations}`);\n\n
const convInfo = backend_util.computePool2DInfo(\n x.shape as [number, number, number, number], filterSize,
strides,\n dilations, pad, dimRoundingMode);\n if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1
&&\n util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n return identity({inputs: {x}, backend});\n
}\n\n const maxPoolProgram = new Pool2DProgram(convInfo, 'max', false);\n return
backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPoolConfig: KernelConfig =
{\n kernelName: MaxPool,\n backendName: 'webgl',\n kernelFunc: maxPool as {} as KernelFunc\n};\n"/**\n *
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copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *

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*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool3DProgram} from '../pool_gpu';\n\nexport function maxPool3d(args: {\n inputs: MaxPool3DInputs,\n
backend: MathBackendWebGL,\n attrs: MaxPool3DAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} =
args;\n const {x} = inputs;\n const {filterSize, strides, pad, dataFormat, dimRoundingMode} = attrs;\n const
dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo = backend_util.computePool3DInfo(\n
x.shape as [number, number, number, number, number], filterSize, strides,\n dilations, pad, dimRoundingMode,
dataFormat);\n const maxPoolProgram = new Pool3DProgram(convInfo, 'max', false);\n return
backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPool3DConfig: KernelConfig
= {\n kernelName: MaxPool3D,\n backendName: 'webgl',\n kernelFunc: maxPool3d as {} as

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KernelFunc\n};\n","/*\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gggpu_math';\n\nexport class MaxPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padTop = effectiveFilterHeight - 1 -
convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex =
effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n    const ivec2 pads = ivec2(${padTop},
${padLeft});\n\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int b = coords[0];\n      int d =
coords[3];\n\n      ivec2 dyRCCorner = coords.yz - pads;\n      int dyRCorner = dyRCCorner.x;\n      int
dyCCorner = dyRCCorner.y;\n\n      // Convolve dy(?, ?, d) with pos mask(:, :, d) to get dx(xR, xC, d).\n      // ? =
to be determined. : = across all values in that axis.\n      float dotProd = 0.0;\n      for (int wR = 0; wR <
${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n        float dyR = float(dyRCorner + wR) /
${strideHeight}.0;\n\n        if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {\n
continue;\n        }\n        int idyR = int(dyR);\n\n        for (int wC = 0; wC < ${effectiveFilterWidth}; wC++) {\n
          float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n          if (dyC < 0.0 || dyC >=
${convInfo.outWidth}.0 ||\n              fract(dyC) > 0.0) {\n            continue;\n          }\n          int idyC =
int(dyC);\n\n          float dyValue = getDy(b, idyR, idyC, d);\n          int maxPosValue = ${lastIndex} -
int(getMaxPos(b, idyR, idyC, d));\n\n          // Get the current value, check it against the value from the\n          //
position matrix.\n          int curPosValue = wR * ${effectiveFilterWidth} + wC;\n          float mask =
float(maxPosValue == curPosValue ? 1.0 : 0.0);\n          dotProd += dyValue * mask;\n        }\n      }\n\n      setOutput(dotProd);\n    }\n  }\n}\n\nexport class MaxPool3DBackpropProgram implements
GPGPUProgram {\n  variableNames = ['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideDepth =
convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationDepth = convInfo.dilationDepth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterDepth =
convInfo.effectiveFilterDepth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n    const padFront = effectiveFilterDepth - 1 -
convInfo.padInfo.front;\n    const padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft =
effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex =\n      effectiveFilterDepth *
effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n    const ivec3 pads = ivec3(${padFront},
${padTop}, ${padLeft});\n\n    void main() {\n      ivec5 coords = getOutputCoords();\n      int batch =
coords.x;\n      int ch = coords.u;\n\n      ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n      int
dyDCorner = dyCorner.x;\n      int dyRCorner = dyCorner.y;\n      int dyCCorner = dyCorner.z;\n\n      //
Convolve dy(?, ?, ?, ch) with pos mask(:, :, :, d) to get\n      // dx(xD, xR, xC, ch).\n      // ? = to be determined. : =
across all values in that axis.\n      float dotProd = 0.0;\n\n      for (int wD = 0; wD < ${effectiveFilterDepth};\n          wD += ${dilationDepth}) {\n        float dyD = float(dyDCorner + wD) / ${strideDepth}.0;\n\n        if (dyD <
0.0 || dyD >= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n          continue;\n        }\n        int idyD =

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int(dyD);\n\n    for (int wR = 0; wR < ${effectiveFilterHeight};\n        wR += ${dilationHeight}) {\n
float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n    if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0\n
||\n        fract(dyR) > 0.0) {\n        continue;\n    }\n    int idyR = int(dyR);\n\n    for (int wC =\n
0; wC < ${effectiveFilterWidth};\n        wC += ${dilationWidth}) {\n        float dyC = float(dyCCorner +\n
wC) / ${strideWidth}.0;\n\n        if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n            fract(dyC) > 0.0)\n
{\n            continue;\n        }\n        int idyC = int(dyC);\n\n        float dyValue = getDy(batch, idyD,\n
idyR, idyC, ch);\n        int maxPosValue = ${lastIndex} -\n            int(getMaxPos(batch, idyD, idyR, idyC,\n
ch));\n        // Get the current value, check it against the value from the\n            // position matrix.\n
int curPosValue =\n            wD * ${effectiveFilterHeight} * ${effectiveFilterWidth} +\n            wR *\n
${effectiveFilterWidth} + wC;\n        float mask = float(maxPosValue == curPosValue ? 1.0 : 0.0);\n\n
dotProd += dyValue * mask;\n    }\n    }\n    }\n    setOutput(dotProd);\n    }\n    `;\n    }\n    }\n    }"/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n
the specific language governing permissions and\n * limitations under the License.\n *

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*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3DGrad, MaxPool3DGradAttrs,\n
MaxPool3DGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from\n
'./backend_webgl';\nimport {MaxPool3DBackpropProgram} from './max_pool_backprop_gpu';\nimport\n
{Pool3DProgram} from './pool_gpu';\n\nexport function maxPool3DGrad(args: {\n    inputs:\n
MaxPool3DGradInputs,\n    backend: MathBackendWebGL,\n    attrs: MaxPool3DGradAttrs\n}): TensorInfo {\n
const {inputs, backend, attrs} = args;\n    const {dy, input} = inputs;\n    const x = input;\n    const {filterSize, strides,\n
pad, dimRoundingMode} = attrs;\n    const dilations: [number, number, number] = [1, 1, 1];\n\n    const convInfo =\n
backend_util.computePool3DInfo(\n        x.shape as [number, number, number, number, number], filterSize, strides,\n
dilations, pad, dimRoundingMode);\n\n    const maxPool3dPositionsProgram =\n        new\n
Pool3DProgram(convInfo, 'max', true /* get positions */);\n    const maxPool3dPositions =\n
backend.runWebGLProgram(maxPool3dPositionsProgram, [x, x.dtype]);\n    const maxPoolBackpropProgram = new\n
MaxPool3DBackpropProgram(convInfo);\n    const result = backend.runWebGLProgram(\n
maxPoolBackpropProgram, [dy, maxPool3dPositions], x.dtype);\n
backend.disposeIntermediateTensorInfo(maxPool3dPositions);\n    return result;\n}\n\nexport const\n
maxPoolGrad3DConfig: KernelConfig = {\n    kernelName: MaxPool3DGrad,\n    backendName: 'webgl',\n
kernelFunc: maxPool3DGrad as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n
file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPoolGrad, MaxPoolGradAttrs, MaxPoolGradInputs,\n
TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport\n
{MaxPool2DBackpropProgram} from './max_pool_backprop_gpu';\nimport {Pool2DProgram} from\n
'./pool_gpu';\nimport {assertNotComplex} from './webgl_util';\n\nexport function maxPoolGrad(args: {\n    inputs:\n
MaxPoolGradInputs,\n    backend: MathBackendWebGL,\n    attrs: MaxPoolGradAttrs\n}): TensorInfo {\n
const {inputs, backend, attrs} = args;\n    const {dy, input, output} = inputs;\n    const x = input;\n    assertNotComplex([input,\n
output], 'maxPoolGrad');\n    const {filterSize, strides, pad, dimRoundingMode} = attrs;\n    const convInfo =

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backend_util.computePool2DInfo(\n    x.shape as [number, number, number, number], filterSize, strides,\n    dilations */, pad, dimRoundingMode);\n const getPositions = true;\n const maxPoolPositionsProgram =\n new\n Pool2DProgram(convInfo, 'max', getPositions);\n const maxPoolPositions: TensorInfo =\n backend.runWebGLProgram(maxPoolPositionsProgram, [x], x.dtype);\n\n const maxPoolBackPropProgram = new\n MaxPool2DBackpropProgram(convInfo);\n const result = backend.runWebGLProgram(\n maxPoolBackPropProgram, [dy, maxPoolPositions], x.dtype);\n\n backend.disposeIntermediateTensorInfo(maxPoolPositions);\n return result;\n}\n\nexport const\n maxPoolGradConfig: KernelConfig = {\n kernelName: MaxPoolGrad,\n backendName: 'webgl',\n kernelFunc:\n maxPoolGrad as { } as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n *=====\n\n */\n\nimport { backend_util, TensorInfo } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from\n './backend_webgl';\nimport { Pool2DProgram } from './pool_gpu';\n\nexport function maxPoolWithArgmaxImpl(\n x: TensorInfo, includeBatchInIndex: boolean,\n convInfo: backend_util.Conv2DInfo,\n backend:\n MathBackendWebGL): TensorInfo[] {\n let program = new Pool2DProgram(convInfo, 'max', false);\n const\n poolOutput = backend.runWebGLProgram(program, [x], 'float32');\n program = new Pool2DProgram(convInfo,\n 'max', true, true, includeBatchInIndex);\n const indexOutput = backend.runWebGLProgram(program, [x],\n 'float32');\n return [poolOutput, indexOutput];\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n *=====\n\n */\n\nimport { MaxPoolWithArgmax, MaxPoolWithArgmaxAttrs, MaxPoolWithArgmaxInputs } from\n '@tensorflow/tfjs-core';\nimport { backend_util, KernelConfig, util } from '@tensorflow/tfjs-core';\nimport\n { MathBackendWebGL } from './backend_webgl';\nimport { maxPoolWithArgmaxImpl } from\n './MaxPoolWithArgmax_impl';\n\nexport const maxPoolWithArgmaxConfig: KernelConfig = {\n kernelName:\n MaxPoolWithArgmax,\n backendName: 'webgl',\n kernelFunc: ((inputs, attrs, backend) => {\n const { x } =\n inputs as MaxPoolWithArgmaxInputs;\n const { filterSize, strides, pad, includeBatchInIndex } =\n attrs as {\n as MaxPoolWithArgmaxAttrs;\n const webglBackend = backend as MathBackendWebGL;\n\n util.assert(\n x.shape.length === 4,\n () => `Error in maxPool: input must be rank 4 but got rank ${\n x.shape.length}`);\n const dilations: [number, number] = [1, 1];\n util.assert(\n backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => `Error in maxPool: Either strides or\n dilations must be 1.` +\n `Got strides ${strides} and dilations ${dilations}`);\n\n const convInfo =\n backend_util.computePool2DInfo(\n x.shape as [number, number, number, number], filterSize, strides,\n dilations, pad);\n\n const [result, indexes] =\n maxPoolWithArgmaxImpl(x, includeBatchInIndex, convInfo,\n webglBackend);\n return [result, indexes];\n } )};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {reduce} from './kernel_utils/reduce';\nimport {reshape} from './kernels/Reshape';\n\nexport function meanImpl(\n  x: TensorInfo, reduceShape: number[], outShape: number[],\n  backend: MathBackendWebGL): TensorInfo {\n  const inSize = util.sizeFromShape(reduceShape);\n  const xSize = util.sizeFromShape(x.shape);\n  const batchSize = xSize / inSize;\n  const reshapedInput =\n    reshape({inputs: {x}, attrs: {shape: [batchSize, inSize]}, backend});\n  const reduced = reduce(reshapedInput, 'float32', 'mean', backend);\n  const reshapedOutput =\n    reshape({inputs: {x: reduced}, attrs: {shape: outShape}, backend});\n  backend.disposeIntermediateTensorInfo(reshapedInput);\n  backend.disposeIntermediateTensorInfo(reduced);\n  return reshapedOutput;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
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=====\n*\n\nimport {backend_util, KernelConfig, Mean, MeanAttrs, MeanInputs, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {meanImpl} from './Mean_impl';\nimport {transposeImpl, transposeImplCPU} from './Transpose_impl';\n\nexport const meanConfig: KernelConfig = {\n  kernelName: Mean,\n  backendName: 'webgl',\n  kernelFunc: ({inputs, attrs, backend}) => {\n    const {x} = inputs as MeanInputs;\n    const {keepDims, axis} = attrs as {} as MeanAttrs;\n    const webglBackend = backend as MathBackendWebGL;\n    const xRank = x.shape.length;\n    const origAxes = util.parseAxisParam(axis, x.shape);\n    let axes = origAxes;\n    const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n    const meanInputIsTransposed = permutedAxes !== null;\n    const shouldExecuteOnCPU = webglBackend.shouldExecuteOnCPU([x]);\n    const intermediates: TensorInfo[] = [];\n    let meanInput = x;\n    if (meanInputIsTransposed) {\n      if (shouldExecuteOnCPU) {\n        const xTexData = webglBackend.texData.get(meanInput.dataId);\n        const values = xTexData.values as TypedArray;\n        const newShape: number[] = new Array(xRank);\n        for (let i = 0; i < newShape.length; i++) {\n          newShape[i] = x.shape[permutedAxes[i]];\n        }\n        const meanInputValues =\n          transposeImplCPU(values, x.shape, x.dtype, permutedAxes, newShape);\n        meanInput = webglBackend.makeTensorInfo(newShape, x.dtype);\n        const meanInputData = webglBackend.texData.get(meanInput.dataId);\n        meanInputData.values = meanInputValues;\n      } else {\n        meanInput = transposeImpl(x, permutedAxes, webglBackend);\n      }\n      intermediates.push(meanInput);\n      axes = backend_util.getInnerMostAxes(axes.length, xRank);\n    }\n    backend_util.assertAxesAreInnerMostDims('sum', axes, xRank);\n    const [meanOutShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(meanInput.shape, axes);\n    let outShape = meanOutShape;\n    if (keepDims) {\n      // rather than reshape at the end, set the target shape here.\n      outShape = backend_util.expandShapeToKeepDim(meanOutShape, origAxes);\n    }\n    const out = meanImpl(meanInput, reduceShape, outShape, webglBackend);\n    for (const i of intermediates) {\n      webglBackend.disposeIntermediateTensorInfo(i);\n    }\n    return out;\n  }\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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governing permissions and\n * limitations under the License.\n *

```
=====\n\n*\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from\n '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {reduce} from\n './kernel_utils/reduce';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\nexport\n function min(\n   args: {inputs: MinInputs, backend: MathBackendWebGL, attrs: MinAttrs});\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n const xRank =\n x.shape.length;\n\n const origAxes = util.parseAxisParam(axis, x.shape);\n let axes = origAxes;\n const\n permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let permutedX = x;\n if (permutedAxes != null)\n {\n   permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n   axes =\n backend_util.getInnerMostAxes(axes.length, x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('min', axes, xRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n const inSize =\n util.sizeFromShape(reduceShape);\n const a2D =\n   reshape({inputs: {x: permutedX}, backend, attrs: {shape: [-\n 1, inSize]}});\n const reduced = reduce(a2D, a2D.dtype, 'min', backend);\n\n let res;\n if (keepDims) {\n const\n newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n res = reshape({inputs: {x: reduced},\n backend, attrs: {shape: newShape}});\n } else {\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape:\n outShape}});\n }\n\n backend.disposeIntermediateTensorInfo(a2D);\n\n backend.disposeIntermediateTensorInfo(reduced);\n\n if (permutedAxes != null) {\n backend.disposeIntermediateTensorInfo(permutedX);\n }\n\n return res;\n }\n\nexport const minConfig:\n KernelConfig = {\n kernelName: Min,\n backendName: 'webgl',\n kernelFunc: min as } as\n KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n */
```

```
=====\n\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from\n './shader_compiler';\nexport class MirrorPadProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n   xShape: number[],\n   paddings: Array<[number,\n number]>,\n   mode: 'reflect'|'symmetric') {\n this.outputShape = paddings.map(\n (p, i) => p[0] /* beforePad\n */ + xShape[i] + p[1] /* afterPad */);\n const rank = xShape.length;\n const dtype =\n getCoordsDataType(rank);\n\n const start = paddings.map(p => p[0]).join(',');\n const end = paddings.map((p, i)\n => p[0] + xShape[i]).join(',');\n const unpackedCoords =\n ['coords[0]', 'coords[1]', 'coords[2]',\n 'coords[3]'].slice(0, rank);\n const offset = mode === 'reflect' ? 0 : 1;\n\n if (rank === 1) {\n this.userCode =\n `\n int start = ${start};\n int end = ${end};\n void main() {\n int outC = getOutputCoords();\n if (outC < start) {\n outC = start * 2 - outC - ${offset};\n } else if (outC >= end) {\n outC =\n (end - 1) * 2 - outC + ${offset};\n }\n setOutput(getX(outC - start));\n }\n `;\n return;\n }\n\n this.userCode = `\n ${dtype} start = ${dtype}(${start});\n ${dtype} end = ${dtype}(${end});\n\n void\n main() {\n ${dtype} outC = getOutputCoords();\n for (int i = 0; i < ${rank}; i++) {\n if (outC[i] <\n start[i]) {\n outC[i] = start[i] * 2 - outC[i] - ${offset};\n } else if (outC[i] >= end[i]) {\n outC[i] =\n (end[i] - 1) * 2 - outC[i] + ${offset};\n }\n }\n ${dtype} coords = outC - start;\n setOutput(getX(${unpackedCoords}));\n }\n `;\n }\n\n"/**\n * @license\n * Copyright 2020 Google LLC.\n All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\n/**\n * Example shader code for\n * `mirrorPad(tf.tensor1d([1, 2, 3], 'int32'), [[2, 2]], 'reflect')`\n * ``\n * const int start = int(2);\n * const int end = int(5);\n * void main()\n * {\n *   int outputLoc = getOutputCoords();\n *   vec4 result = vec4(0.);\n *   int rc = outputLoc;\n *   int source = rc;\n *   if (source < start) {\n *     source = start * 2 - source - 0;\n *   } else if (source >= end)\n *   {\n *     source = (end - 1) * 2 - source + 0;\n *   }\n *   source -= start;\n *   result[0] =\n *   getChannel(getX(source), source);\n *   rc += 1;\n *   if(rc < 6) {\n *     int source = rc;\n *     if (source <\n * start) {\n *       source = start * 2 - source - 0;\n *     } else if (source >= end) {\n *       source = (end - 1) *\n * 2 - source + 0;\n *     }\n *     source -= start;\n *     result[1] = getChannel(getX(source), source);\n *   }\n *   setOutput(result);\n * }\n *``\n *\n * @export class MirrorPadPackedProgram implements\n * GPGPUProgram {\n *   variableNames = ['x'];\n *   packedInputs = true;\n *   packedOutput = true;\n *   outputShape:\n *   number[];\n *   userCode: string;\n *   constructor(\n *     xShape: number[],\n *     paddings: Array<[number, number]>,\n *     mode: 'reflect'|'symmetric') {\n *     this.outputShape = paddings.map(\n *       (p, i) => p[0] /* beforePad */ + xShape[i]\n *       + p[1] /* afterPad */);\n *     const rank = xShape.length;\n *     const dtype = getCoordsDataType(rank);\n *     const start\n * = paddings.map(p => p[0]).join(',');\n *     const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n *     const\n * coords = getChannels('rc', rank);\n *     const source = getChannels('source', rank);\n *     const cLimit = `${coords[rank -\n * 1]} < ${this.outputShape[rank - 1]}`;\n *     const innerDims =\n *       rank === 1 ? 'source': `vec2(${source.slice(-\n * 2).join()})`;\n *     const offset = mode === 'reflect' ? 0 : 1;\n *     let mainLoop = `;\n *     if (rank === 1) {\n *       const\n * padSetup = `\n *       ${dtype} source = rc;\n *       if (source < start) {\n *         source = start * 2 - source - ${offset};\n *       }\n *       else if (source >= end) {\n *         source = (end - 1) * 2 - source + ${offset};\n *       }\n *       source -= start;\n *     `;\n *     mainLoop = `\n *     ${dtype} rc = outputLoc;\n *     ${padSetup}\n *     result[0] =\n *     getChannel(getX(${source.join()}), ${innerDims});\n *     ${coords[rank - 1]} += 1;\n *     if(${cLimit}) {\n *     ${padSetup}\n *     result[1] = getChannel(getX(${source.join()}), ${innerDims});\n *     }\n *     `;\n *   } else {\n *     const padSetup = `\n *     ${dtype} source = rc;\n *     ${dtype} lt = ${dtype}(lessThan(source, start));\n *     ${dtype} gte = ${dtype}(greaterThanEqual(source, end));\n *     ${dtype} orig = 1 - (lt + gte);\n *     source = orig *\n * source +\n * lt * (start * 2 - source - ${offset}) +\n * gte * ((end - 1) * 2 - source + ${offset});\n * source -= start;\n * `;\n *     mainLoop = `\n *     ${dtype} rc = outputLoc;\n *     ${padSetup}\n *     result[0] =\n *     getChannel(getX(${source.join()}), ${innerDims});\n *     ${coords[rank - 1]} += 1;\n *     if(${cLimit}) {\n *     ${padSetup}\n *     result[1] = getChannel(getX(${source.join()}), ${innerDims});\n *     }\n *     rc = outputLoc;\n *     ${coords[rank - 2]} += 1;\n *     if(${coords[rank - 2]} < ${this.outputShape[rank - 2]}) {\n *     ${padSetup}\n *     result[2] = getChannel(getX(${source.join()}), ${innerDims});\n *     ${coords[rank - 1]} += 1;\n *   }\n *   if(${cLimit}) {\n *     ${padSetup}\n *     result[3] = getChannel(getX(${source.join()}), ${innerDims});\n *   }\n *   `;\n *   }\n *   this.userCode = `\n *   const ${dtype} start = ${dtype}(${start});\n *   const ${dtype}\n * end = ${dtype}(${end});\n *   void main() {\n *     ${dtype} outputLoc = getOutputCoords();\n *     vec4 result =\n * vec4(0.);\n *     ${mainLoop}\n *     setOutput(result);\n *   }\n * `;\n * }\n *``\n *\n * @license\n * Copyright 2020\n * Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n * may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *`
```

```
=====\n*\n\nimport {env, KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs, TensorInfo} from\n '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {MirrorPadProgram}
```



```
from './mirror_pad_gpu';\nimport {MirrorPadPackedProgram} from './mirror_pad_packed_gpu';\n\nexport const\nmirrorPadKernelFunc: (params: {\n  inputs: MirrorPadInputs,\n  backend: MathBackendWebGL,\n  attrs:\n  MirrorPadAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n  const {x} = inputs;\n  const {paddings,\n  mode} = attrs;\n\n  const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n  new\n  MirrorPadPackedProgram(x.shape, paddings, mode) :\n  new MirrorPadProgram(x.shape, paddings, mode);\n\n  const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n  return output;\n};\n\nexport const\nmirrorPadConfig: KernelConfig = {\n  kernelName: MirrorPad,\n  backendName: 'webgl',\n  kernelFunc:\n  mirrorPadKernelFunc as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights\n  Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n  except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport {KernelConfig, KernelFunc, Mod} from '@tensorflow/tfjs-core';\nimport\n{CHECK_NAN_SNIPPET} from './binaryop_packed_gpu';\nimport {binaryKernelFunc} from\n './kernel_utils/kernel_funcs_utils';\n\nconst MOD = `if (b == 0.0) return NaN;\n return mod(a, b);`\n\nconst\nMOD_PACKED = `\n  vec4 result = mod(a, b);\n  vec4 isNaN = vec4(equal(b, vec4(0.0)));\n  ` +\nCHECK_NAN_SNIPPET + `\n return result;\n`;\n\nexport const mod = binaryKernelFunc({\n  opSnippet: MOD,\n  packedOpSnippet: MOD_PACKED,\n});\n\nexport const modConfig: KernelConfig = {\n  kernelName: Mod,\n  backendName: 'webgl',\n  kernelFunc: mod as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017\n  Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you\n  may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n  software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n  governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport\nclass MultinomialProgram implements GPGPUProgram {\n  variableNames = ['probs'];\n  outputShape: number[];\n  userCode: string;\n\n  // Caching uniform location for speed.\n  seedLoc: WebGLUniformLocation;\n\n  constructor(batchSize: number, numOutcomes: number, numSamples: number) {\n    this.outputShape = [batchSize,\n    numSamples];\n\n    this.userCode = `\n      uniform float seed;\n      void main() {\n        ivec2 coords =\n        getOutputCoords();\n        int batch = coords[0];\n        float r = random(seed);\n        float cdf = 0.0;\n\n        for\n        (int i = 0; i < ${numOutcomes - 1}; i++) {\n          cdf += getProbs(batch, i);\n\n          if (r < cdf) {\n            setOutput(float(i));\n            return;\n          }\n\n          // If no other event happened, last event happened.\n          setOutput(float(${numOutcomes - 1}));\n        }\n      `;\n\n      getCustomSetupFunc(seed: number) {\n        return\n        (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n          if (this.seedLoc == null) {\n            this.seedLoc = gpgpu.getUniformLocation(webGLProgram, 'seed');\n          }\n\n          gpgpu.gl.uniform1f(this.seedLoc,\n          seed);\n        };\n      }\n    `;\n\n    /**\n     * @license\n     * Copyright 2020 Google LLC. All Rights Reserved.\n     * Licensed under\n     * the Apache License, Version 2.0 (the \"License\");\n     * you may not use this file except in compliance with the\n     * License.\n     * You may obtain a copy of the License at\n     *  
http://www.apache.org/licenses/LICENSE-2.0\n     * Unless required by applicable law or agreed to in writing,\n     * software\n     * distributed under the License is distributed\n     * on an \"AS IS\" BASIS,\n     * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n     * implied.\n     * See the License for the specific language governing permissions and\n     * limitations under the\n     * License.\n     */\n  }\n}
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*\n\nimport {RealDiv} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-
core';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\n// Without the equality check div
produces 0.9999 for a = b, which when\n// floored can cause errors.\nconst DIV = \nif (a == b) {\n return
1.0;\n};\nreturn a / b;\n\n// We do the same as in ./binaryop_gpu, with vec4 and ivec4.\n// On Linux, the vectorized
implementation produces NaNs when a and b are 0.\nconst DIV_PACKED = \n // vec4 one = vec4(equal(a, b));\n
// return one + (vec4(1.0) - one) * a / b;\n vec4 result = a / b;\n if(a.x == b.x) {\n result.x = 1.;\n }
\n if(a.y ==
b.y) {\n result.y = 1.;\n }\n if(a.z == b.z) {\n result.z = 1.;\n }\n if(a.w == b.w) {\n result.w = 1.;\n }
\n\n
return result;\n`;\n\nexport const realDiv = binaryKernelFunc(\n {opSnippet: DIV, packedOpSnippet:
DIV_PACKED, checkOutOfBounds: true});\n\nexport const realDivConfig: KernelConfig = {\n kernelName:
RealDiv,\n backendName: 'webgl',\n kernelFunc: realDiv,\n};\n\n"/**\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {exp} from
'./Exp';\nimport {max} from './Max';\nimport {realDiv} from './RealDiv';\nimport {reshape} from
'./Reshape';\nimport {sub} from './Sub';\nimport {sum} from './Sum';\n\nexport function softmax(args: {\n inputs:
SoftmaxInputs,\n backend: MathBackendWebGL,\n attrs: SoftmaxAttrs\n}): TensorInfo {\n const {inputs,
backend, attrs} = args;\n const {logits} = inputs;\n const {dim} = attrs;\n\n const axes =
util.parseAxisParam([dim], logits.shape);\n\n const maxLogit = max({\n inputs: {x: logits},\n backend,\n
attrs: {reductionIndices: axes, keepDims: false}\n });\n\n const expandedShape =
backend_util.expandShapeToKeepDim(maxLogit.shape, axes);\n\n const maxLogitsReshaped =\n
reshape({inputs: {x: maxLogit}, backend, attrs: {shape: expandedShape}});\n\n const a =\n sub({inputs: {a: logits,
b: maxLogitsReshaped}, backend}) as TensorInfo;\n\n const b = exp({inputs: {x: a}, backend}) as TensorInfo;\n
\n const sumExp =\n sum({inputs: {x: b}, backend, attrs: {axis: axes, keepDims: false}});\n\n const
sumExpReshaped =\n reshape({inputs: {x: sumExp}, backend, attrs: {shape: expandedShape}});\n\n const res
=\n realDiv({inputs: {a: b, b: sumExpReshaped}, backend}) as TensorInfo;\n\n
backend.disposeIntermediateTensorInfo(maxLogit);\n
backend.disposeIntermediateTensorInfo(maxLogitsReshaped);\n\n backend.disposeIntermediateTensorInfo(a);\n
\n backend.disposeIntermediateTensorInfo(b);\n\n backend.disposeIntermediateTensorInfo(sumExp);\n
\n backend.disposeIntermediateTensorInfo(sumExpReshaped);\n\n return res;\n}\n\nexport const softmaxConfig:
KernelConfig = {\n kernelName: Softmax,\n backendName: 'webgl',\n kernelFunc: softmax as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport {KernelConfig, KernelFunc, Multinomial, MultinomialAttrs, MultinomialInputs, TensorInfo} from
'@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{MultinomialProgram} from '../multinomial_gpu';\nimport {softmax} from './Softmax';\n\nexport function
multinomial(args: {\n inputs: MultinomialInputs,\n backend: MathBackendWebGL,\n attrs: MultinomialAttrs\n}):

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TensorInfo {\n const {inputs, backend, attrs} = args;\n const {logits} = inputs;\n const {numSamples, seed,
normalized} = attrs;\n\n const probs = normalized ?\n logits :\n softmax(\n {inputs: {logits}, backend,
attrs: {dim: logits.shape.length - 1}});\n const batchSize = probs.shape[0];\n const numOutcomes =
probs.shape[1];\n const program = new MultinomialProgram(batchSize, numOutcomes, numSamples);\n const
customSetup = program.getCustomSetupFunc(seed);\n\n const res = backend.runWebGLProgram(program, [probs],
'int32', customSetup);\n if (!normalized) {\n backend.disposeIntermediateTensorInfo(probs);\n }\n return
res;\n}\n\nexport const multinomialConfig: KernelConfig = {\n kernelName: Multinomial,\n backendName:
'webgl',\n kernelFunc: multinomial as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*/\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV3,
NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TypedArray} from '@tensorflow/tfjs-core';\n\nconst
nonMaxSuppressionV3Impl = kernel_impls.nonMaxSuppressionV3Impl;\n\nimport {MathBackendWebGL} from
'./backend_webgl';\n\nexport function nonMaxSuppressionV3(args: {\n inputs: NonMaxSuppressionV3Inputs,\n
backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV3Attrs\n}) {\n backend_util.warn(\n
'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n 'Call tf.nonMaxSuppressionAsync() instead');\n\n
const {inputs, backend, attrs} = args;\n const {boxes, scores} = inputs;\n const {maxOutputSize, iouThreshold,
scoreThreshold} = attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const
scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const {selectedIndices} =
nonMaxSuppressionV3Impl(\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold);\n\n
return backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new
Int32Array(selectedIndices));\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV3 as {} as
KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*/\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV4,
NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo, TypedArray} from '@tensorflow/tfjs-
core';\n\nconst nonMaxSuppressionV4Impl = kernel_impls.nonMaxSuppressionV4Impl;\n\nimport
{MathBackendWebGL} from './backend_webgl';\n\nexport function nonMaxSuppressionV4(args: {\n inputs:
NonMaxSuppressionV4Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV4Attrs\n}):
[TensorInfo, TensorInfo] {\n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n
'Call tf.nonMaxSuppressionAsync() instead');\n\n const {inputs, backend, attrs} = args;\n const {boxes, scores} =
inputs;\n const {maxOutputSize, iouThreshold, scoreThreshold, padToMaxOutputSize} =\n attrs;\n\n const
boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals =
backend.readSync(scores.dataId) as TypedArray;\n\n const {selectedIndices, validOutputs} =
nonMaxSuppressionV4Impl(\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n return [\n backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new

```

```
Int32Array(selectedIndices)),\n  backend.makeTensorInfo([], 'int32', new Int32Array([validOutputs])))\n];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n  kernelName: NonMaxSuppressionV4,\n  backendName: 'webgl',\n  kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV5,\n  NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nconst nonMaxSuppressionV5Impl = kernel_impls.nonMaxSuppressionV5Impl;\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nexport function nonMaxSuppressionV5(args: {\n  inputs: NonMaxSuppressionV5Inputs,\n  backend: MathBackendWebGL,\n  attrs: NonMaxSuppressionV5Attrs\n}): [TensorInfo, TensorInfo] {\n  backend_util.warn(\n    'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n    'Call tf.nonMaxSuppressionAsync() instead');\n\n  const {inputs, backend, attrs} = args;\n  const {boxes, scores} = inputs;\n  const {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma} = attrs;\n\n  const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n  const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n  const maxOutputSizeVal = maxOutputSize;\n  const iouThresholdVal = iouThreshold;\n  const scoreThresholdVal = scoreThreshold;\n  const softNmsSigmaVal = softNmsSigma;\n\n  const {selectedIndices, selectedScores} = nonMaxSuppressionV5Impl(\n    boxesVals, scoresVals, maxOutputSizeVal, iouThresholdVal,\n    scoreThresholdVal, softNmsSigmaVal);\n\n  return [\n    backend.makeTensorInfo([\n      selectedIndices.length, 'int32', new Int32Array(selectedIndices)],\n    backend.makeTensorInfo([\n      selectedScores.length, 'float32', new Float32Array(selectedScores)]),\n  ];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n  kernelName: NonMaxSuppressionV5,\n  backendName: 'webgl',\n  kernelFunc: nonMaxSuppressionV5 as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class OneHotProgram implements GPGPUProgram {\n  variableNames = ['indices'];\n  outputShape: number[];\n  userCode: string;\n\n  // Caching uniform location for speed.\n  seedLoc: WebGLUniformLocation;\n\n  constructor(\n    numIndices: number, depth: number, onValue: number, offValue: number) {\n    this.outputShape = [numIndices, depth];\n    this.userCode = `\n    void main() {\n      ivec2 coords = getOutputCoords();\n      int index = round(getIndices(coords.x));\n      setOutput(mix(float(${offValue}), float(${onValue}),\n        float(index == coords.y)));\n    }\n  `;\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"\n * BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */
```

```
=====\n\n*/\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs, TensorInfo, util} from
```

```

'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {OneHotProgram}
from './onehot_gpu';\nimport {reshape} from './Reshape';\n\nexport const oneHot = (args: {\n inputs:
OneHotInputs,\n backend: MathBackendWebGL,\n attrs: OneHotAttrs\n}): TensorInfo => {\n const {inputs,
backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const
indicesSize = util.sizeFromShape(indices.shape);\n const program = new OneHotProgram(indicesSize, depth,
onValue, offValue);\n const reshaped =\n reshape({inputs: {x: indices}, backend, attrs: {shape:
[indicesSize]}});\n const result = backend.runWebGLProgram(program, [reshaped], indices.dtype);\n
backend.disposeIntermediateTensorInfo(reshaped);\n\n const outShape = [...indices.shape, depth];\n const out =
reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});\n
backend.disposeIntermediateTensorInfo(result);\n return out;\n};\n\nexport const oneHotConfig: KernelConfig =
{\n kernelName: OneHot,\n backendName: 'webgl',\n kernelFunc: oneHot as {} as KernelFunc\n};\n\n"/**\n *
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2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {complex} from './Complex';\nimport
{fill} from './Fill';\nimport {imag} from './Imag';\nimport {real} from './Real';\n\nexport function zerosLike(\n
args: {inputs: ZerosLikeInputs, backend: MathBackendWebGL}): TensorInfo {\n const {inputs, backend} = args;\n
const {x} = inputs;\n\n if (x.dtype === 'complex64') {\n const realPart = real({inputs: {input: x}, backend});\n
const r = zerosLike({inputs: {x: realPart}, backend});\n const imagPart = imag({inputs: {input: x}, backend});\n
const i = zerosLike({inputs: {x: imagPart}, backend});\n\n const result = complex({inputs: {real: r, imag: i},
backend});\n\n backend.disposeIntermediateTensorInfo(realPart);\n
backend.disposeIntermediateTensorInfo(r);\n backend.disposeIntermediateTensorInfo(imagPart);\n
backend.disposeIntermediateTensorInfo(i);\n\n return result;\n } else {\n return fill({\n attrs: {\n shape:
x.shape,\n dtype: x.dtype,\n value: x.dtype === 'string' ? " : 0\n },\n backend\n });\n }\n}\n\nexport
const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'webgl',\n kernelFunc:
zerosLike as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====\n
*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {complex} from './Complex';\nimport
{fill} from './Fill';\nimport {imag} from './Imag';\nimport {real} from './Real';\nimport {zerosLike} from
'./ZerosLike';\n\nexport function onesLike(\n args: {inputs: OnesLikeInputs, backend: MathBackendWebGL}):
TensorInfo {\n const {inputs, backend} = args;\n const {x} = inputs;\n\n if (x.dtype === 'string') {\n throw new
Error('onesLike is not supported under string dtype');\n } else if (x.dtype === 'complex64') {\n const realPart =
real({inputs: {input: x}, backend});\n const r = onesLike({inputs: {x: realPart}, backend});\n const imagPart =
imag({inputs: {input: x}, backend});\n const i = zerosLike({inputs: {x: imagPart}, backend});\n\n const result =
complex({inputs: {real: r, imag: i}, backend});\n\n backend.disposeIntermediateTensorInfo(realPart);\n
backend.disposeIntermediateTensorInfo(r);\n backend.disposeIntermediateTensorInfo(imagPart);\n

```

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backend.disposeIntermediateTensorInfo(i);\n\n  return result;\n } else {\n  // TODO(cais, smilkov): Add WebGL
shader for onesLike;\n  // https://github.com/tensorflow/tfjs/issues/1293\n  return fill({attrs: {shape: x.shape,
dtype: x.dtype, value: 1}, backend});\n } }\n\nexport const onesLikeConfig: KernelConfig = {\n  kernelName:
OnesLike,\n  backendName: 'webgl',\n  kernelFunc: onesLike as { } as KernelFunc\n};\n"/**\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {concat} from './Concat';\nimport
{expandDims} from './ExpandDims';\n\nexport function pack(\n  args: {inputs: PackInputs, backend:
MathBackendWebGL, attrs: PackAttrs});\n  TensorInfo {\n    const {inputs, backend, attrs} = args;\n    const {axis} =
attrs;\n\n    if (inputs.length === 1) {\n      return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim:
axis}});\n    }\n\n    const shape = inputs[0].shape;\n    const dtype = inputs[0].dtype;\n\n    inputs.forEach(t => {\n
util.assertShapesMatch(\n      shape, t.shape,\n      'All tensors passed to stack must have matching shapes');\n
util.assert(\n      dtype === t.dtype,\n      () => 'All tensors passed to stack must have matching dtypes');\n    });\n\n
const intermediateTensorInfos: TensorInfo[] = [];\n    const expandedTensors = inputs.map(t => {\n      const
expandedT =\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n
intermediateTensorInfos.push(expandedT);\n      return expandedT;\n    });\n\n    const result = concat({inputs:
expandedTensors, backend, attrs: {axis}});\n\n    intermediateTensorInfos.forEach(\n      t =>
backend.disposeIntermediateTensorInfo(t);\n    );\n\n    return result;\n  }\n\nexport const packConfig: KernelConfig = {\n
kernelName: Pack,\n  backendName: 'webgl',\n  kernelFunc: pack as { } as KernelFunc\n};\n"/**\n * @license\n *
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License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */

```

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=====\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'/shader_compiler';\n\nexport class PadProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    xShape: number[], paddings: Array<[number,
number]>,\n    constantValue: number) {\n    this.outputShape = paddings.map(\n      (p, i) => p[0] /* beforePad */
+ xShape[i] + p[1] /* afterPad */);\n    const rank = xShape.length;\n    const type = getCoordsDataType(rank);\n\n
const start = paddings.map(p => p[0]).join(',');\n    const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n
const unpackedCoords =\n      ['coords[0]', 'coords[1]', 'coords[2]', 'coords[3]'].slice(0, rank);\n\n    if (rank === 1)
{\n      this.userCode = `\n      int start = ${start};\n      int end = ${end};\n\n      void main() {\n        int outC =
getOutputCoords();\n        if (outC < start || outC >= end) {\n          setOutput(float(${constantValue}));\n        }
else {\n          setOutput(getX(outC - start));\n        }\n      }\n      `;\n      return;\n    }\n\n    this.userCode = `\n
${type} start = ${type}(${start});\n    ${type} end = ${type}(${end});\n\n    void main() {\n      ${type} outC =
getOutputCoords();\n      if (any(lessThan(outC, start)) || any(greaterThanEqual(outC, end))) {\n
setOutput(float(${constantValue}));\n      } else {\n        ${type} coords = outC - start;\n
setOutput(getX(${unpackedCoords}));\n      }\n    }\n  `;\n  }\n\n  /**\n   * @license\n   * Copyright 2019
Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the "License");\n   * you
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```

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```
=====  
*  
\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class PadPackedProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    xShape: number[],\n    paddings: Array<[number, number]>,\n    constantValue: number) {\n    this.outputShape = paddings.map((p, i) => p[0] /* beforePad */ + xShape[i] + p[1] /* afterPad */);\n    const rank = xShape.length;\n    const dtype = getCoordsDataType(rank);\n\n    const start = paddings.map(p => p[0]).join(',');\n    const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n    const coords = getChannels('rc', rank);\n    const source = getChannels('source', rank);\n    const cLimit = `${coords[rank - 1]} < ${this.outputShape[rank - 1]}`;\n    const innerDims =\n      rank === 1 ? 'source' : `vec2(${source.slice(-2).join(',')}`;\n    const componentSetup = [\n      `${dtype} rc = outputLoc;`,\n      `${coords[rank - 1]} += 1;`\n    ];\n    if (cLimit) {\n      rank === 1 ? `rc = outputLoc;` : `${coords[rank - 2]} += 1;`\n    }\n    if (coords[rank - 2] < this.outputShape[rank - 2]) {\n      rank === 1 ? `rc = outputLoc;` : `${coords[rank - 1]} += 1;`\n    }\n    if (cLimit) {\n      `rc < start || rc >= end` : `any(lessThan(rc, start)) || any(greaterThanEqual(rc, end))`;\n    }\n    let mainLoop = `for (let i = 0, j = rank === 1 ? 2 : 4; i < j; i++)`\n    {\n      mainLoop += `\n        ${componentSetup[i]}\n        if (${paddingArea}) {\n          result[${i}] = float(${constantValue});\n        } else {\n          ${dtype} source = rc - start;\n          result[${i}] = getChannel(getX(${source.join()}), ${innerDims});\n        }\n      `;\n    }\n    mainLoop += `(rank === 1 ? `)` : `)`;\n    this.userCode = `\n      const ${dtype} start = ${dtype}(${start});\n      const ${dtype} end = ${dtype}(${end});\n      void main() {\n        ${dtype} outputLoc = getOutputCoords();\n        vec4 result = vec4(0);\n        ${mainLoop}\n        setOutput(result);\n      }\n    `;\n  }\n}\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.\n */
```

```
=====  
*  
\nimport {env, KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from './backend_webgl';\nimport {PadProgram} from './pad_gpu';\nimport {PadPackedProgram} from './pad_packed_gpu';\n\nexport const padV2 = (\n  args: {inputs: PadV2Inputs, backend: MathBackendWebGL, attrs: PadV2Attrs}):\n  TensorInfo => {\n    const {inputs, backend, attrs} = args;\n    const {x} = inputs;\n    const {paddings, constantValue} = attrs;\n\n    const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n      new PadPackedProgram(x.shape, paddings, constantValue) :\n      new PadProgram(x.shape, paddings, constantValue);\n    return backend.runWebGLProgram(program, [x], x.dtype);\n  };\n\nexport const padV2Config: KernelConfig = {\n  kernelName: PadV2,\n  backendName: 'webgl',\n  kernelFunc: padV2 as {} as KernelFunc\n};\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.\n */
```

```

*\n\nimport {KernelConfig, KernelFunc, Pow} from '@tensorflow/tfjs-core';\n\nimport
{CHECK_NAN_SNIPPET} from '../binaryop_packed_gpu';\n\nimport {binaryKernelFunc} from
'../kernel_utils/kernel_funcs_utils';\n\nconst POW = ` \n  if(a < 0.0 && floor(b) < b){\n    return NAN;\n  }\n  if (b
== 0.0) {\n    return 1.0;\n  }\n  return (round(mod(b, 2.0)) != 1) ?\n    pow(abs(a), b) : sign(a) * pow(abs(a),
b);\n`;\n\nconst POW_PACKED = ` \n  // isModRound1 has 1 for components with round(mod(b, 2.0)) == 1, 0
otherwise.\n  vec4 isModRound1 = vec4(equal(round(mod(b, 2.0)), ivec4(1)));\n  vec4 multiplier = sign(a) *
isModRound1 + (vec4(1.0) - isModRound1);\n  vec4 result = multiplier * pow(abs(a), b);\n  // Ensure that a^0 = 1,
including 0^0 = 1 as this correspond to TF and JS\n  bvec4 isExpZero = equal(b, vec4(0.0));\n  result.r =
isExpZero.r ? 1.0 : result.r;\n  result.g = isExpZero.g ? 1.0 : result.g;\n  result.b = isExpZero.b ? 1.0 : result.b;\n
result.a = isExpZero.a ? 1.0 : result.a;\n\n  vec4 isNaN = vec4(lessThan(a, vec4(0.0))) * vec4(lessThan(floor(b),
b));\n  ` +\n  CHECK_NAN_SNIPPET + `\n  return result;\n`;\n\nexport const pow =\n
binaryKernelFunc({opSnippet: POW, packedOpSnippet: POW_PACKED});\n\nexport const powConfig:
KernelConfig = {\n  kernelName: Pow,\n  backendName: 'webgl',\n  kernelFunc: pow as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\n\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport
const range =\n  (args: {backend: MathBackendWebGL, attrs: RangeAttrs}): TensorInfo => {\n    const {backend,
attrs} = args;\n    const {start, stop, step, dtype} = attrs;\n    const values = rangeImplCPU(start, stop, step,
dtype);\n    return backend.makeTensorInfo([values.length], dtype, values);\n  };\n\nexport const rangeConfig:
KernelConfig = {\n  kernelName: Range,\n  backendName: 'webgl',\n  kernelFunc: range as { } as
KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====\n
*\n\nimport {KernelConfig, Reciprocal} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
'../kernel_utils/kernel_funcs_utils';\n\nconst RECIPROCAL = `return 1.0 / x;`;\n\nexport const reciprocal =
unaryKernelFunc({opSnippet: RECIPROCAL});\n\nexport const reciprocalConfig: KernelConfig = {\n
kernelName: Reciprocal,\n  backendName: 'webgl',\n  kernelFunc: reciprocal,\n};\n", "/*\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
=====\n
*\n\nimport {KernelConfig, KernelFunc, Relu} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
'../kernel_utils/kernel_funcs_utils';\n\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst RELU =

```



```

CHECK_NAN_SNIPPET + `
return (x < 0.0) ? 0.0 : x;
const RELU_PACKED = `
vec4 result = x *
vec4(greaterThanEqual(x, vec4(0.0)));
bvec4 isNaN = isnan(x);
result.r = isNaN.r ? x.r : result.r;
result.g =
isNaN.g ? x.g : result.g;
result.b = isNaN.b ? x.b : result.b;
result.a = isNaN.a ? x.a : result.a;
return
result;
`
export const relu = unaryKernelFunc({opSnippet: RELU, packedOpSnippet:
RELU_PACKED});
export const reluConfig: KernelConfig = {kernelName: Relu, backendName:
'webgl', kernelFunc: relu as { } as KernelFunc};
"/**
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 * limitations under the License.
 */
=====
`
import {KernelConfig, KernelFunc, Relu6} from '@tensorflow/tfjs-core';
import {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';
import {CHECK_NAN_SNIPPET} from './unaryop_gpu';
const RELU6 =
CHECK_NAN_SNIPPET + `
return (x < 0.0) ? 0.0 : min(6.0, x);
const RELU6_PACKED = `
vec4
result = min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0)));
bvec4 isNaN = isnan(x);
result.r = isNaN.r
? x.r : result.r;
result.g = isNaN.g ? x.g : result.g;
result.b = isNaN.b ? x.b : result.b;
result.a = isNaN.a ? x.a :
result.a;
return result;
`
export const relu6 = unaryKernelFunc({opSnippet: RELU6, packedOpSnippet:
RELU6_PACKED});
export const relu6Config: KernelConfig = {kernelName: Relu6, backendName:
'webgl', kernelFunc: relu6 as { } as KernelFunc};
"/**
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 * limitations under the License.
 */
=====
`
import {GPGPUProgram} from './gpgpu_math';
export class ResizeBilinearProgram implements
GPGPUProgram {
variableNames = ['A'];
outputShape: number[] = [];
userCode: string;
constructor(
inputShape: [number, number, number, number], newHeight: number,
newWidth: number, alignCorners:
boolean, halfPixelCenters: boolean) {
const [batch, oldHeight, oldWidth, depth] = inputShape;
this.outputShape = [batch, newHeight, newWidth, depth];
const effectiveInSize: [number, number] = [
(alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,
(alignCorners && newWidth > 1) ? oldWidth -
1 : oldWidth
];
const effectiveOutSize: [number, number] = [
(alignCorners && newHeight > 1) ?
newHeight - 1 : newHeight,
(alignCorners && newWidth > 1) ? newWidth - 1 : newWidth
];
let
sourceFracIndexRC: string;
if (halfPixelCenters) {
sourceFracIndexRC = `(vec2(yRC) + vec2(0.5))
 * effectiveInputOverOutputRatioRC` +
` - vec2(0.5)`;
} else {
sourceFracIndexRC = `vec2(yRC) *
effectiveInputOverOutputRatioRC`;
}
this.userCode = `
const vec2
effectiveInputOverOutputRatioRC = vec2(
${effectiveInSize[0] / effectiveOutSize[0]},
${effectiveInSize[1] / effectiveOutSize[1]});
const vec2 inputShapeRC = vec2(${oldHeight}.0,
${oldWidth}.0);
void main() {
ivec4 coords = getOutputCoords();
int b = coords[0];
int d
= coords[3];
ivec2 yRC = coords.yz;
// Fractional source index.
vec2 sourceFracIndexRC =
${sourceFracIndexRC};
// Compute the four integer indices.
ivec2 sourceFloorRC =
ivec2(max(sourceFracIndexRC, vec2(0.0)));
ivec2 sourceCeilRC = ivec2(
min(inputShapeRC - 1.0,
ceil(sourceFracIndexRC)));
float topLeft = getA(b, sourceFloorRC.x, sourceFloorRC.y, d);
float
bottomLeft = getA(b, sourceCeilRC.x, sourceFloorRC.y, d);
float topRight = getA(b, sourceFloorRC.x,
sourceCeilRC.y, d);
float bottomRight = getA(b, sourceCeilRC.x, sourceCeilRC.y, d);
vec2 fracRC =

```

```

sourceFracIndexRC = vec2(sourceFloorRC);
float top = topLeft + (topRight - topLeft) * fracRC.y;
float bottom = bottomLeft + (bottomRight - bottomLeft) * fracRC.y;
float newValue = top + (bottom - top) *
fracRC.x;
setOutput(newValue);
}
};
}
}
", "/*
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 * limitations under the License.
 *

```

```

=====
*/
import {GPGPUProgram} from './gpgpu_math';
export class ResizeBilinearPackedProgram implements
GPGPUProgram {
  variableNames = ['A'];
  packedInputs = true;
  packedOutput = true;
  outputShape:
number[] = [];
  userCode: string;
  constructor(
    inputShape: [number, number, number, number],
    newHeight: number,
    newWidth: number,
    alignCorners: boolean,
    halfPixelCenters: boolean) {
    const [batch,
oldHeight, oldWidth, depth] = inputShape;
    this.outputShape = [batch, newHeight, newWidth, depth];
    const effectiveInSize: [number, number] = [
    (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,
(alignCorners && newWidth > 1) ? oldWidth - 1 : oldWidth
];
    const effectiveOutSize: [number, number]
= [
    (alignCorners && newHeight > 1) ? newHeight - 1 : newHeight,
(alignCorners && newWidth > 1) ?
newWidth - 1 : newWidth
];
    let sourceFracIndexRC: string;
    if (halfPixelCenters) {
sourceFracIndexRC = `(vec3(yRC) + vec3(0.5)) * ` +
`effectiveInputOverOutputRatioRC - vec3(0.5)`;
} else {
sourceFracIndexRC = `vec3(yRC) * effectiveInputOverOutputRatioRC`;
}
    this.userCode = `
const vec3 effectiveInputOverOutputRatioRC = vec3(
    ${effectiveInSize[0] / effectiveOutSize[0]},
    ${effectiveInSize[1] / effectiveOutSize[1]},
    ${effectiveInSize[1] / effectiveOutSize[1]});
const vec3
inputShapeRC = vec3(${oldHeight}.0, ${oldWidth}.0,
    ${oldWidth}.0);
float
getAValue(int b, int r, int c, int d) {
return getChannel(getA(b, r, c, d), vec2(c, d));
}
void main()
{
ivec4 coords = getOutputCoords();
int b = coords[0];
int d = coords[3];
// Calculate
values for next column in yRC.z
ivec3 yRC = coords.yzz + ivec3(0, 0, 1);
// Fractional source
index
vec3 sourceFracIndexRC = ${sourceFracIndexRC};
// Compute the four integer indices.
ivec3 sourceFloorRC = ivec3(max(sourceFracIndexRC, vec3(0.0)));
ivec3 sourceCeilRC = ivec3(
min(inputShapeRC - 1.0, ceil(sourceFracIndexRC)));
// Should we calculate next column and row elements
in 2x2 packed cell.
bool hasNextCol = d < ${depth - 1};
bool hasNextRow = coords.z < ${newWidth -
1};
// In parallel, construct four corners for all four components in
// packed 2x2 cell.
vec4
topLeft = vec4(
getAValue(b, sourceFloorRC.x, sourceFloorRC.y, d),
    hasNextCol ? getAValue(b,
sourceFloorRC.x, sourceFloorRC.y, d + 1)
    : 0.0,
    hasNextRow ? getAValue(b,
sourceFloorRC.x, sourceFloorRC.z, d)
    : 0.0,
    (hasNextRow && hasNextCol) ?
getAValue(b, sourceFloorRC.x, sourceFloorRC.z, d + 1) : 0.0);
vec4 bottomLeft = vec4(
getAValue(b, sourceCeilRC.x, sourceFloorRC.y, d),
    hasNextCol ? getAValue(b, sourceCeilRC.x,
sourceFloorRC.y, d + 1)
    : 0.0,
    hasNextRow ? getAValue(b, sourceCeilRC.x, sourceFloorRC.z,
d)
    : 0.0,
    (hasNextRow && hasNextCol) ?
getAValue(b, sourceCeilRC.x,
sourceFloorRC.z, d + 1) : 0.0);
vec4 topRight = vec4(
getAValue(b, sourceFloorRC.x,
sourceCeilRC.y, d),
    hasNextCol ? getAValue(b, sourceFloorRC.x, sourceCeilRC.y, d + 1)
    :
0.0,
    hasNextRow ? getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d)
    : 0.0,
    (hasNextRow && hasNextCol) ?
getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d + 1) : 0.0);
vec4 bottomRight = vec4(
getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d),
    hasNextCol ?
getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d + 1)
    : 0.0,
    hasNextRow ? getAValue(b,
sourceCeilRC.x, sourceCeilRC.z, d)
    : 0.0,
    (hasNextRow && hasNextCol) ?
getAValue(b, sourceCeilRC.x, sourceCeilRC.z, d + 1) : 0.0);
vec3 fracRC = sourceFracIndexRC -
vec3(sourceFloorRC);
vec4 top = mix(topLeft, topRight, fracRC.yzz);
vec4 bottom =

```

```

mix(bottomLeft, bottomRight, fracRC.yyyy);\n      vec4 newValue = mix(top, bottom, fracRC.x);\n\nsetOutput(newValue);\n  }\n  `;\n }\n}\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {env, KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ResizeBilinearProgram} from '../resize_bilinear_gpu';\nimport {ResizeBilinearPackedProgram} from '../resize_bilinear_packed_gpu';\n\nexport function resizeBilinear(args: {\n  inputs: ResizeBilinearInputs,\n  backend: MathBackendWebGL,\n  attrs: ResizeBilinearAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {images} = inputs;\n  const {alignCorners, halfPixelCenters, size} = attrs;\n\n  const [newHeight, newWidth] = size;\n\n  const program = env().getBool('WEBGL_PACK_IMAGE_OPERATIONS') ?\n    new ResizeBilinearPackedProgram(\n      images.shape as [number, number, number, number], newHeight,\n      newWidth,\n      alignCorners, halfPixelCenters) :\n    new ResizeBilinearProgram(\n      images.shape as [number, number, number, number], newHeight, newWidth,\n      alignCorners, halfPixelCenters);\n\n  return backend.runWebGLProgram(program, [images], 'float32');\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n  kernelName: ResizeBilinear,\n  backendName: 'webgl',\n  kernelFunc: resizeBilinear as {} as KernelFunc\n};\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {GPGPUProgram} from '../gpgpu_math';\n\nexport class ResizeBilinearBackpropProgram implements GPGPUProgram {\n  variableNames = ['dy'];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(\n    dyShape: [number, number, number, number],\n    inputShape: [number, number, number, number],\n    alignCorners: boolean) {\n    this.outputShape = inputShape;\n    const [xHeight, xWidth, ] = inputShape;\n    const [yHeight, yWidth] = dyShape;\n\n    // In the backwards pass, we want to find the pixels that were generated for\n    // each pixel in the input image the forward pass and add the corresponding\n    // coefficient from dy to the gradient (with some interpolation).\n\n    const effectiveXSize: [number, number] = [\n      (alignCorners && yHeight > 1) ?\n      xHeight - 1 : xHeight,\n      (alignCorners && yWidth > 1) ? xWidth - 1 : xWidth\n    ];\n\n    const effectiveYSize: [number, number] = [\n      (alignCorners && yHeight > 1) ? yHeight - 1 : yHeight,\n      (alignCorners && yWidth > 1) ? yWidth - 1 : yWidth\n    ];\n\n    const heightScale = effectiveXSize[0] / effectiveYSize[0];\n    const widthScale = effectiveXSize[1] / effectiveYSize[1];\n\n    const invHeightScale = 1 / heightScale;\n    const invWidthScale = 1 / widthScale;\n\n    // This defines the size of the window of values around a particular\n    // index in dy that we want to search for contributions to dx.\n    const windowHeight = (Math.ceil(invHeightScale) * 2) + 2;\n    const winWidth = (Math.ceil(invWidthScale) * 2) + 2;\n\n    this.userCode = `\n    void main() {\n      ivec4 coords = getOutputCoords();\n      int b = coords[0];\n      int d = coords[3];\n      int r = coords[1];\n      int c = coords[2];\n\n      float accumulator = 0.0;\n\n      const float heightScale = float(${heightScale});\n      const float widthScale = float(${widthScale});\n      const float invHeightScale = float(${invHeightScale});\n      const float invWidthScale = float(${invWidthScale});\n      const int windowHeight = int(${windowHeight});\n      const int winWidth = int(${winWidth});\n\n      // Compute bounds for where in dy we will look\n      float startRLerp =

```

```

floor(float(r) * invHeightScale);\n    int startDyR = int(startRLerp - float(winHeight / 2));\n\n    float startCLerp
= floor(float(c) * invWidthScale);\n    int startDyC = int(startCLerp - float(winWidth / 2));\n\n    // Loop over
dy\n    for (int dyROffset = 0; dyROffset < winHeight; dyROffset++) {\n        int dyR = dyROffset +
startDyR;\n\n        // Guard against the window exceeding the bounds of dy\n        if (dyR < 0 || dyR >=
${yHeight}) {\n            continue;\n        }\n\n        for (int dyCOffset = 0; dyCOffset < winWidth; dyCOffset++)
{\n            int dyC = dyCOffset + startDyC;\n\n            // Guard against the window exceeding the bounds of dy\n
if (dyC < 0 || dyC >= ${xWidth}) {\n                continue;\n            }\n\n            float dxR = float(dyR) *
heightScale;\n            int topDxRIndex = int(floor(dxR));\n            int bottomDxRIndex = int(min(ceil(dxR),
${xHeight - 1}.0));\n            float dxRLerp = dxR - float(topDxRIndex);\n            float inverseDxRLerp = 1.0 -
dxRLerp;\n\n            float dxC = float(dyC) * widthScale;\n            int leftDxCIndex = int(floor(dxC));\n            int
rightDxCIndex = int(min(ceil(dxC), ${xWidth - 1}.0));\n            float dxCLerp = dxC - float(leftDxCIndex);\n
float inverseDxClerp = 1.0 - dxCLerp;\n\n            if (r == topDxRIndex && c == leftDxCIndex) {\n                //
topLeft\n                accumulator +=\n                getDy(b, dyR, dyC, d) * inverseDxRLerp * inverseDxClerp;\n
            }\n\n            if (r == topDxRIndex && c == rightDxCIndex) {\n                // topRight\n                accumulator +=
getDy(b, dyR, dyC, d) * inverseDxRLerp * dxCLerp;\n            }\n\n            if (r == bottomDxRIndex && c ==
leftDxCIndex) {\n                // bottomLeft\n                accumulator += getDy(b, dyR, dyC, d) * dxRLerp *
inverseDxClerp;\n            }\n\n            if (r == bottomDxRIndex && c == rightDxCIndex) {\n                //
bottomRight\n                accumulator += getDy(b, dyR, dyC, d) * dxRLerp * dxCLerp;\n            }\n        }\n\n        // End loop over dy\n        setOutput(accumulator);\n    }\n    }\n}\n\n", "/*\n * @license\n * Copyright
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you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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```

```

=====\n
*\n\nimport { KernelConfig, KernelFunc, ResizeBilinearGrad, ResizeBilinearGradAttrs, ResizeBilinearGradInputs,
TensorInfo } from '@tensorflow/tfjs-core';\n\nimport { MathBackendWebGL } from '../backend_webgl';\n\nimport
{ ResizeBilinearBackpropProgram } from '../resize_bilinear_backprop_gpu';\n\nexport function
resizeBilinearGrad(args: {\n  inputs: ResizeBilinearGradInputs,\n  backend: MathBackendWebGL,\n  attrs:
ResizeBilinearGradAttrs\n}): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { images, dy } = inputs;\n
const { alignCorners } = attrs;\n\n  const program = new ResizeBilinearBackpropProgram(\n    dy.shape as [number,
number, number, number],\n    images.shape as [number, number, number, number], alignCorners);\n\n  return
backend.runWebGLProgram(program, [dy], dy.dtype);\n}\n\nexport const resizeBilinearGradConfig: KernelConfig
= {\n  kernelName: ResizeBilinearGrad,\n  backendName: 'webgl',\n  kernelFunc: resizeBilinearGrad as {} as
KernelFunc\n};\n\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

```

=====\n
*\n\nimport { GPGPUProgram } from './gpgpu_math';\n\nexport class ResizeNearestNeighborProgram implements
GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(\n
inputShape: [number, number, number, number], newHeight: number,\n    newWidth: number, alignCorners:
boolean, halfPixelCenters: boolean) {\n    const [batch, oldHeight, oldWidth, depth] = inputShape;\n
this.outputShape = [batch, newHeight, newWidth, depth];\n\n    const effectiveInSize: [number, number] = [n

```

```

    (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,\n    (alignCorners && newWidth > 1) ? oldWidth -
    1 : oldWidth\n    ];\n\n    const effectiveOutSize: [number, number] = [\n    (alignCorners && newHeight > 1) ?
    newHeight - 1 : newHeight,\n    (alignCorners && newWidth > 1) ? newWidth - 1 : newWidth\n    ];\n\n    // When
    align corners is false, we rounds the value with floor.\n    const roundBase = alignCorners ? '0.5' : '0.0';\n\n    let
    sourceFracIndexRC: string;\n    if (halfPixelCenters) {\n    sourceFracIndexRC =\n    `max((vec2(yRC) +
    vec2(0.5)) * effectiveInputOverOutputRatioRC` +\n    ``, vec2(0.0))`;\n    } else {\n    sourceFracIndexRC =
    `vec2(yRC) * effectiveInputOverOutputRatioRC`;\n    }\n\n    this.userCode = `\n    const vec2
    effectiveInputOverOutputRatioRC = vec2(\n    `${effectiveInSize[0] / effectiveOutSize[0]},\n
    ${effectiveInSize[1] / effectiveOutSize[1]});`;\n    const vec2 inputShapeRC = vec2(`${oldHeight}.0,
    ${oldWidth}.0);`\n\n    void main() {\n    ivec4 coords = getOutputCoords();\n    int b = coords[0];\n    int d
    = coords[3];\n    ivec2 yRC = coords.yz;\n\n    // Fractional source index.\n    vec2 sourceFracIndexRC =
    `${sourceFracIndexRC}`;\n\n    // Compute the coordinators of nearest neighbor point.\n    ivec2
    sourceNearestRC = ivec2(\n    min(inputShapeRC - 1.0, floor(sourceFracIndexRC + `${roundBase}`));`\n\n
    float newValue = getA(b, sourceNearestRC.x, sourceNearestRC.y, d);\n\n    setOutput(newValue);\n    }\n    `;\n
    }\n\n    "/**\n    * @license\n    * Copyright 2020 Google LLC. All Rights Reserved.\n    * Licensed under the Apache
    License, Version 2.0 (the "License");\n    * you may not use this file except in compliance with the License.\n    * You
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    by applicable law or agreed to in writing, software\n    * distributed under the License is distributed on an "AS IS"
    BASIS,\n    * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n    * See the
    License for the specific language governing permissions and\n    * limitations under the License.\n    *
    =====\n
    *\n    \n    import {KernelConfig, KernelFunc, ResizeNearestNeighbor, ResizeNearestNeighborAttrs,
    ResizeNearestNeighborInputs, TensorInfo} from '@tensorflow/tfjs-core';\n    import {MathBackendWebGL} from
    './backend_webgl';\n    import {ResizeNearestNeighborProgram} from './resize_nearest_neighbor_gpu';\n\n    export
    function resizeNearestNeighbor(args: {\n    inputs: ResizeNearestNeighborInputs,\n    backend:
    MathBackendWebGL,\n    attrs: ResizeNearestNeighborAttrs\n    }): TensorInfo {\n    const {inputs, backend, attrs} =
    args;\n    const {images} = inputs;\n    const {alignCorners, halfPixelCenters, size} = attrs;\n\n    const [newHeight,
    newWidth] = size;\n\n    const program = new ResizeNearestNeighborProgram(\n    images.shape as [number,
    number, number, number], newHeight, newWidth,\n    alignCorners, halfPixelCenters);\n    return
    backend.runWebGLProgram(program, [images], images.dtype);\n    }\n\n    export const resizeNearestNeighborConfig:
    KernelConfig = {\n    kernelName: ResizeNearestNeighbor,\n    backendName: 'webgl',\n    kernelFunc:
    resizeNearestNeighbor as { } as KernelFunc\n    };`;\n    "/**\n    * @license\n    * Copyright 2018 Google LLC. All Rights
    Reserved.\n    * Licensed under the Apache License, Version 2.0 (the "License");\n    * you may not use this file
    except in compliance with the License.\n    * You may obtain a copy of the License at\n    *\n    *
    http://www.apache.org/licenses/LICENSE-2.0\n    *\n    * Unless required by applicable law or agreed to in writing,
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    OR CONDITIONS OF ANY KIND, either express or implied.\n    * See the License for the specific language
    governing permissions and\n    * limitations under the License.\n    *
    =====\n
    *\n    \n    import {GPGPUProgram} from './gpgpu_math';\n\n    export class ResizeNearestNeighborBackpropProgram
    implements GPGPUProgram {\n    variableNames = ['dy'];\n    outputShape: number[] = [];\n    userCode: string;\n\n
    constructor(\n    dyShape: [number, number, number, number],\n    inputShape: [number, number, number,
    number], alignCorners: boolean) {\n    this.outputShape = inputShape;\n    const [, xHeight, xWidth, ] =
    inputShape;\n    const [, yHeight, yWidth] = dyShape;\n\n    // In the backwards pass, we want to find the pixels that
    were generated for\n    // each pixel in the input image the forward pass and add the corresponding\n    // coefficient
    from dy to the gradient (with some interpolation).\n\n    const effectiveXSize: [number, number] = [\n
    (alignCorners && yHeight > 1) ? xHeight - 1 : xHeight,\n    (alignCorners && yWidth > 1) ? xWidth - 1 :
    xWidth\n    ];\n\n    const effectiveYSize: [number, number] = [\n    (alignCorners && yHeight > 1) ? yHeight - 1 :
  
```

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yHeight,\n  (alignCorners && yWidth > 1) ? yWidth - 1 : yWidth\n  ];\n\n  const heightScale =\n  effectiveXSize[0] / effectiveYSize[0];\n  const widthScale = effectiveXSize[1] / effectiveYSize[1];\n\n  const\n  invHeightScale = 1 / heightScale;\n  const invWidthScale = 1 / widthScale;\n\n  // This defines the size of the\n  window of values around a particular\n  // index in dy that we want to search for contributions to dx.\n  const\n  winHeight = (Math.ceil(invHeightScale) * 2) + 2;\n  const winWidth = (Math.ceil(invWidthScale) * 2) + 2;\n\n  this.userCode = `\n  void main() {\n    ivec4 coords = getOutputCoords();\n    int b = coords[0];\n    int d =\n    coords[3];\n    int r = coords[1];\n    int c = coords[2];\n\n    float accumulator = 0.0;\n\n    const float\n    heightScale = float(${heightScale});\n    const float widthScale = float(${widthScale});\n\n    const float\n    invHeightScale = float(${invHeightScale});\n    const float invWidthScale = float(${invWidthScale});\n\n    const int winHeight = int(${winHeight});\n    const int winWidth = int(${winWidth});\n\n    // Compute bounds\n    for where in dy we will look\n    float startRLerp = floor(float(r) * invHeightScale);\n    int startDyR =\n    int(floor(startRLerp - float(winHeight / 2)));\n\n    float startCLerp = floor(float(c) * invWidthScale);\n    int\n    startDyC = int(floor(startCLerp - float(winWidth / 2)));\n\n    // Loop over dy\n    for (int dyROffset = 0;\n    dyROffset < winHeight; dyROffset++) {\n      int dyR = dyROffset + startDyR;\n\n      // Guard against the\n      window exceeding the bounds of dy\n      if (dyR < 0 || dyR >= ${yHeight}) {\n        continue;\n      }\n\n      for (int dyCOffset = 0; dyCOffset < winWidth; dyCOffset++) {\n        int dyC = dyCOffset + startDyC;\n\n        // Guard against the window exceeding the bounds of dy\n        if (dyC < 0 || dyC >= ${yWidth}) {\n          continue;\n        }\n\n        float sourceFracRow =\n        float(${effectiveXSize[0]}) *\n        (float(dyR) / float(${effectiveYSize[0]}));\n\n        float sourceFracCol =\n        float(${effectiveXSize[1]})\n        *\n        (float(dyC) / float(${effectiveYSize[1]}));\n\n        int sourceNearestRow = int(min(\n        float(int(${xHeight}) - 1),\n        ${alignCorners} ? float(round(sourceFracRow)) :\n        float(floor(sourceFracRow)));\n\n        int sourceNearestCol = int(min(\n        float(int(${xWidth}) - 1),\n        ${alignCorners} ? float(round(sourceFracCol)) :\n        float(floor(sourceFracCol)));\n\n        if (r == sourceNearestRow && c == sourceNearestCol) {\n          accumulator += getDy(b, dyR, dyC, d);\n        }\n      }\n    }\n\n    // End loop over dy\n    setOutput(accumulator);\n  }\n  `;\n\n  **\n  * @license\n  * Copyright 2020 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version\n  2.0 (the \"License\");\n  * you may not use this file except in compliance with the License.\n  * You may obtain a\n  copy of the License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  * Unless required by applicable\n  law or agreed to in writing, software\n  * distributed under the License is distributed on an \"AS IS\" BASIS,\n  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License for\n  the specific language governing permissions and\n  * limitations under the License.\n  *\n  =====\n\n  *\n  * import {KernelConfig, KernelFunc, ResizeNearestNeighborGrad, ResizeNearestNeighborGradAttrs,\n  ResizeNearestNeighborGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n  * import {MathBackendWebGL}\n  * from './backend_webgl';\n  * import {ResizeNearestNeighborBackpropProgram} from\n  './resize_nearest_neighbor_backprop_gpu';\n  * export function resizeNearestNeighborGrad(args: {\n  * inputs:\n  * ResizeNearestNeighborGradInputs,\n  * backend: MathBackendWebGL,\n  * attrs:\n  * ResizeNearestNeighborGradAttrs\n  * }): TensorInfo {\n  * const {inputs, backend, attrs} = args;\n  * const {images, dy} =\n  * inputs;\n  * const {alignCorners} = attrs;\n  * const program = new ResizeNearestNeighborBackpropProgram(\n  * dy.shape as [number, number, number, number],\n  * images.shape as [number, number, number, number],\n  * alignCorners);\n  * return backend.runWebGLProgram(program, [dy], dy.dtype);\n  * }\n  *\n  * export const\n  * resizeNearestNeighborGradConfig: KernelConfig = {\n  * kernelName: ResizeNearestNeighborGrad,\n  * backendName: 'webgl',\n  * kernelFunc: resizeNearestNeighborGrad as {} as KernelFunc\n  * };\n  *\n  * **\n  * @license\n  * Copyright 2017 Google LLC. 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the specific language governing permissions and limitations under the License.

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*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class ReverseProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(xShape: number[], axis: number[]) {\n    const rank = xShape.length;\n    if (rank > 4) {\n      throw new Error(`WebGL backend: Reverse of rank-${rank} tensor is not yet supported`);\n    }\n    this.outputShape = xShape;\n\n    if (rank === 1) {\n      this.userCode = `void main() {\n      int coord = getOutputCoords();\n      setOutput(getX(${xShape[0]} - coord - 1));\n    }\n    `;\n      return;\n    }\n\n    const getInCoord = (i: number) => {\n      if (axis.indexOf(i) !== -1 && xShape[i] !== 1) {\n        return `${xShape[i]} - coords[${i]} - 1`;\n      }\n      return `coords[${i}]`;\n    };\n\n    const inCoords = xShape.map((_, i) => getInCoord(i)).join(',');\n\n    const type = getCoordsDataType(rank);\n\n    this.userCode = `void main() {\n    ${type} coords = getOutputCoords();\n    setOutput(getX(${inCoords}));\n  }\n  `;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n=====
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*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class ReversePackedProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(xShape: number[], axis: number[]) {\n    const rank = xShape.length;\n    if (rank > 4) {\n      throw new Error(`WebGL backend: Reverse of rank-${rank} tensor is not yet supported`);\n    }\n    this.outputShape = xShape;\n\n    const channels = getChannels('rc', rank);\n    const nextColumn = `${channels[rank - 1]} + 1 < ${this.outputShape[rank - 1]}`;\n    const nextRow = `${channels[rank - 2]} + 1 < ${this.outputShape[rank - 2]}`;\n\n    const type = getCoordsDataType(rank);\n\n    if (rank === 1) {\n      this.userCode = `void main() {\n      int rc = getOutputCoords();\n      vec4 result = vec4(0);\n      result.r = getChannel(getX(${xShape[0]} - rc - 1), ${xShape[0]} - rc - 1);\n      if (${nextColumn}) {\n        result.g = getChannel(getX(${xShape[0]} - (rc + 1) - 1), ${xShape[0]} - (rc + 1) - 1);\n      }\n      setOutput(result);\n    }\n    `;\n    } else {\n      this.userCode = `void main() {\n      ${type} rc = getOutputCoords();\n      vec4 result = vec4(0);\n      result.r = ${getR(channels.slice())};\n      if (${nextColumn}) {\n        result.g = ${getG(channels.slice())};\n      }\n      if (${nextRow}) {\n        result.b = ${getB(channels.slice())};\n        if (${nextColumn}) {\n          result.a = ${getA(channels.slice())};\n        }\n      }\n      setOutput(result);\n    }\n    `;\n\n    function getR(channels: string[]): string {\n      return getChannel(channels);\n    }\n\n    function getG(channels: string[]): string {\n      channels[rank - 1] = '(' + channels[rank - 1] + ` + 1`;\n      return getChannel(channels);\n    }\n\n    function getB(channels: string[]): string {\n      channels[rank - 2] = '(' + channels[rank - 2] + ` + 1`;\n      return getChannel(channels);\n    }\n\n    function getA(channels: string[]): string {\n      channels[rank - 1] = '(' + channels[rank - 1] + ` + 1`;\n      channels[rank - 2] = '(' + channels[rank - 2] + ` + 1`;\n      return getChannel(channels);\n    }\n\n    function getChannel(channels: string[]): string {\n      const inCoordsArray = xShape.map((_, i) => getInCoord(i, channels));\n      const inCoords = inCoordsArray.join(',');\n      const innerDims = inCoordsArray.slice(-2).join(',');\n      return `getChannel(getX(${inCoords}), vec2(${innerDims}))`;\n    }\n\n    function getInCoord(i: number, channels1: string[]): string {\n      if (axis.indexOf(i) !== -1 && xShape[i] !== 1) {\n        return `${xShape[i]} - ${channels1[i]} - 1`;\n      } else {\n        return `${channels1[i]}`;\n      }\n    }\n  }\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required
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```
=====\n*\n\nimport {env, KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ReverseProgram} from '../reverse_gpu';\nimport {ReversePackedProgram} from '../reverse_packed_gpu';\nimport {identity} from './Identity';\n\nexport function reverse(args: {\n  inputs: ReverseInputs,\n  backend: MathBackendWebGL,\n  attrs: ReverseAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {dims} = attrs;\n  const xRank = x.shape.length;\n  const $dims = util.parseAxisParam(dims, x.shape);\n  if (xRank === 0) {\n    return identity({inputs: {x}, backend});\n  }\n  const program =\n    env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n      new ReversePackedProgram(x.shape, $dims) :\n      new ReverseProgram(x.shape, $dims);\n  return backend.runWebGLProgram(program, [x,\n    x.dtype]);\n}\n\nexport const reverseConfig: KernelConfig = {\n  kernelName: Reverse,\n  backendName: 'webgl',\n  kernelFunc: reverse as {} as KernelFunc\n};\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n*\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class RotateProgram implements GPGPUProgram {\n  variableNames = ['Image'];\n  outputShape: number[] = [];\n  userCode: string;\n  constructor(\n    imageShape: [number, number, number, number],\n    radians: number,\n    fillValue: number|[number, number, number],\n    center: number|[number, number]) {\n    const imageHeight = imageShape[1];\n    const imageWidth = imageShape[2];\n    const sinFactor = Math.sin(radians).toFixed(3);\n    const cosFactor = Math.cos(radians).toFixed(3);\n    this.outputShape = imageShape;\n    const [centerX, centerY] =\n      backend_util.getImageCenter(center, imageHeight, imageWidth);\n    const centerXString = centerX.toFixed(3);\n    const centerYString = centerY.toFixed(3);\n    let fillSnippet = \";\n    if (typeof fillValue === 'number') {\n      fillSnippet = `float outputValue = ${fillValue.toFixed(2)};`;\n    } else {\n      fillSnippet = `vec3 fill = vec3(${fillValue.join(',')});\n      float outputValue = fill[coords[3]];`;\n    }\n    this.userCode = `void main() {\n      ivec4 coords = getOutputCoords();\n      int x = coords[2];\n      int y = coords[1];\n      float coordXFloat = (float(x) - ${centerXString}) * ${\n        cosFactor} - (float(y) - ${centerYString}) * ${sinFactor};\n      float coordYFloat = (float(x) - ${centerXString}) * ${\n        sinFactor} + (float(y) - ${centerYString}) * ${cosFactor};\n      int coordX = int(round(coordXFloat + ${centerXString}));\n      int coordY = int(round(coordYFloat + ${centerYString}));\n      ${fillSnippet}\n      if(coordX >= 0 && coordX < ${imageWidth} && coordY >= 0 && coordY < ${\n        imageHeight}) {\n        outputValue = getImage(coords[0], coordY, coordX, coords[3]);\n        setOutput(outputValue);\n      }\n    }`;\n  }\n}\n\n",/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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```
=====\n*\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\nimport {RotateWithOffset,
```



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RotateWithOffsetAttrs, RotateWithOffsetInputs } from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from '../backend_webgl';\nimport {RotateProgram} from '../rotate_gpu';\n\nexport const rotateWithOffsetConfig:
KernelConfig = {\n  kernelName: RotateWithOffset,\n  backendName: 'webgl',\n  kernelFunc: ({inputs, attrs,
backend}) => {\n    const {image} = inputs as RotateWithOffsetInputs;\n    const {radians, fillValue, center} = attrs
as {\n    } as RotateWithOffsetAttrs;\n    const webglBackend = backend as MathBackendWebGL;\n\n    const program
= new RotateProgram(\n      (image as Tensor4D).shape, radians, fillValue, center);\n    const output =
webglBackend.runWebGLProgram(program, [image], image.dtype);\n    return output;\n  });\n};\n", "/**\n *
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the specific language governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
'../kernel_utils/kernel_funcs_utils';\n\nconst ROUND = \n // OpenGL ES does not support round function.\n // The
algorithm is based on banker's rounding.\n float base = floor(x);\n if ((x - base) < 0.5) {\n   return floor(x);\n }
else if ((x - base) > 0.5) {\n   return ceil(x);\n } else {\n   if (mod(base, 2.0) == 0.0) {\n     return base;\n   }
else {\n     return base + 1.0;\n   }\n }\n};\n\nexport const round = unaryKernelFunc({opSnippet: ROUND});\n\nexport
const roundConfig: KernelConfig = {\n  kernelName: Round,\n  backendName: 'webgl',\n  kernelFunc:
round,\n};\n", "/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
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implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class ScatterProgram implements GPGPUProgram {\n  variableNames = ['updates',
'indices', 'defaultValue'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n    updateSize: number,
sliceDim: number, indicesRank: number,\n    updatesRank: number, strides: number[], shape: number[],\n    summingDupeIndex = true) {\n    this.outputShape = shape;\n    const stridesType =
getCoordsDataType(strides.length);\n    const dtype = getCoordsDataType(shape.length);\n    let indicesString = ";\n
if (indicesRank === 1) {\n      indicesString = 'i';\n    } else if (indicesRank === 2) {\n      indicesString = 'i, j';\n
}\n    const indicesSnippet = `getIndices(${indicesString})`; \n\n    let updatesString = ";\n    if (updatesRank === 1)
{\n      updatesString = 'i';\n    } else if (updatesRank === 2) {\n      updatesString = 'i, coords[1]';\n    }\n    const
updatesSnippet = `getUpdates(${updatesString})`; \n\n    const strideString = sliceDim > 1 ? 'strides[j]' : 'strides';\n
this.userCode = `\n    ${stridesType} strides = ${stridesType}(${strides});\n\n    void main() {\n      ${dtype}
coords = getOutputCoords();\n      float sum = 0.0;\n      bool found = false;\n      for (int i = 0; i <
${updateSize}; i++) {\n        int flattenedIndex = 0;\n        for (int j = 0; j < ${sliceDim}; j++) {\n          int
index = round(${indicesSnippet});\n          flattenedIndex += index * ${strideString};\n        }\n        if
(flattenedIndex == coords[0]) {\n          sum += ${updatesSnippet};\n          found = true;\n        }\n      }\n
      setOutput(mix(getDefaultValue(), sum, float(found)));\n    }\n  `;\n};\n", "/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { backend_util, KernelConfig, KernelFunc, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { ScatterProgram } from './scatter_gpu';\nimport { reshape } from './Reshape';\n\nexport function scatterNd(args: {\n  inputs: ScatterNdInputs,\n  backend: MathBackendWebGL,\n  attrs: ScatterNdAttrs\n}): TensorInfo {\n  const { inputs, backend, attrs } = args;\n  const { indices, updates } = inputs;\n  const { shape } = attrs;\n\n  const { sliceRank, numUpdates, sliceSize, strides, outputSize } =\n    backend_util.calculateShapes(updates, indices, shape);\n\n  const flattenShape = [outputSize / sliceSize, sliceSize];\n\n  if (outputSize === 0) {\n    return\n      backend.makeTensorInfo(shape, indices.dtype);\n  }\n\n  const flattenIndices = reshape(\n    { inputs: { x: indices },\n    backend, attrs: { shape: [numUpdates, sliceRank] }});\n  const flattenX = reshape(\n    { inputs: { x: updates },\n    backend, attrs: { shape: [numUpdates, sliceSize] }});\n\n  const defaultValue = backend.makeTensorInfo(\n    [], 'float32', new Float32Array([0])); // scalar(0)\n  const program = new ScatterProgram(\n    numUpdates, sliceRank, flattenIndices.shape.length, flattenX.shape.length,\n    strides, flattenShape);\n  const res = backend.runWebGLProgram(\n    program, [flattenX, flattenIndices, defaultValue], flattenX.dtype);\n  const reshaped = reshape({ inputs: { x: res }, backend, attrs: { shape }});\n\n  backend.disposeIntermediateTensorInfo(flattenIndices);\n  backend.disposeIntermediateTensorInfo(flattenX);\n  backend.disposeIntermediateTensorInfo(res);\n  backend.disposeIntermediateTensorInfo(defaultValue);\n\n  return reshaped;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n  kernelName: ScatterNd,\n  backendName: 'webgl',\n  kernelFunc: scatterNd as {} as KernelFunc\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
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=====\n*\n\nimport { GPGPUProgram } from './gpgpu_math';\nimport { getCoordsDataType } from './shader_compiler';\n\nexport class SelectProgram implements GPGPUProgram {\n  variableNames = ['c', 'a', 'b'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(cRank: number, shape: number[], rank: number) {\n    this.outputShape = shape;\n\n    let cCoords;\n    let abCoords;\n    if (rank > 4) {\n      throw Error(`Where for rank ${rank} is not yet supported`);\n    }\n    if (rank === 1) {\n      abCoords = `resRC`;\n      cCoords = `resRC`;\n    } else {\n      const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n      const cCoordVars = [];\n      const abCoordVars = [];\n      for (let i = 0; i < shape.length; i++) {\n        abCoordVars.push(`${currentCoords[i]}`);\n        if (i < cRank) {\n          cCoordVars.push(`${currentCoords[i]}`);\n        }\n      }\n      cCoords = cCoordVars.join();\n      abCoords = abCoordVars.join();\n    }\n\n    const dtype = getCoordsDataType(rank);\n    this.userCode = `\n    ${dtype} resRC = getOutputCoords();\n    float cVal = getC(${cCoords});\n    if (cVal >= 1.0) {\n      setOutput(getA(${abCoords}));\n    } else {\n      setOutput(getB(${abCoords}));\n    }\n  `;\n  }\n\n  "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Select, SelectInputs, TensorInfo, upcastType } from '@tensorflow/tfjs-
```

```

core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {SelectProgram} from
 './select_gpu';\n\nexport function select(args: {inputs: SelectInputs, backend: MathBackendWebGL}): \n
TensorInfo {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n\n  const program = \n    new
  SelectProgram(condition.shape.length, t.shape, t.shape.length);\n  return backend.runWebGLProgram(\n
  program, [condition, t, e], upcastType(t.dtype, e.dtype));\n}\n\nexport const selectConfig: KernelConfig = {\n
  kernelName: Select,\n  backendName: 'webgl',\n  kernelFunc: select as {} as KernelFunc\n};\n", "/*\n * @license\n
 * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
  License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
  agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
*\n\nimport {backend_util, KernelConfig, Selu} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
 './kernel_utils/kernel_funcs_utils';\n\nconst SELU = \n // Stable and Attracting Fixed Point (0, 1) for Normalized
  Weights.\n // see: https://arxiv.org/abs/1706.02515\n float scaleAlpha =
  ${backend_util.SELU_SCALEALPHA};\n float scale = ${backend_util.SELU_SCALE};\n return (x >= 0.0) ?
  scale * x : scaleAlpha * (exp(x) - 1.0);\n};\n\nexport const selu = unaryKernelFunc({opSnippet: SELU});\n\nexport
  const seluConfig: KernelConfig = {\n  kernelName: Selu,\n  backendName: 'webgl',\n  kernelFunc:
  selu,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
  Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
  distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *
  =====\n
*\n\nimport {KernelConfig, Sigmoid} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
 './kernel_utils/kernel_funcs_utils';\n\nconst SIGMOID = `return 1.0 / (1.0 + exp(-1.0 * x));`\n\nexport const
  sigmoid = unaryKernelFunc({opSnippet: SIGMOID});\n\nexport const sigmoidConfig: KernelConfig = {\n
  kernelName: Sigmoid,\n  backendName: 'webgl',\n  kernelFunc: sigmoid,\n};\n", "/*\n * @license\n *
  Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
  copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable
  law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
  BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License
  for the specific language governing permissions and\n * limitations under the License.\n *
  =====\n
*\n\nimport {KernelConfig, Sign} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from
 './kernel_utils/kernel_funcs_utils';\n\n// Sign does not propagate NaNs.\nconst SIGN = \n if (isnan(x)) {
  return 0.0; }\n return sign(x);\n};\n\nexport const sign = unaryKernelFunc({opSnippet: SIGN});\n\nexport
  const signConfig: KernelConfig = {\n  kernelName: Sign,\n  backendName: 'webgl',\n  kernelFunc:
  sign,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
  Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
  License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *
  Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
  distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
  implied.\n * See the License for the specific language governing permissions and\n * limitations under the
  License.\n *

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=====
*\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET_UNARY,
unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\n\nconst SIN = CHECK_NAN_SNIPPET_UNARY +
\n return sin(x);\n`;\n\nexport const sin = unaryKernelFunc({opSnippet: SIN});\n\nexport const sinConfig:
KernelConfig = {\n kernelName: Sin,\n backendName: 'webgl',\n kernelFunc: sin,\n};\n", "/*\n * @license\n *
Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, Sinh} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst SINH = `\n float e2x = exp(x);\n return (e2x - 1.0 / e2x) /
2.0;\n`;\n\nexport const sinh = unaryKernelFunc({opSnippet: SINH});\n\nexport const sinhConfig: KernelConfig =
{\n kernelName: Sinh,\n backendName: 'webgl',\n kernelFunc: sinh,\n};\n", "/*\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {KernelConfig, Softplus} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from
'./kernel_utils/kernel_funcs_utils';\n\nconst SOFTPLUS = `\n float epsilon = 1.1920928955078125e-7;\n float
threshold = log(epsilon) + 2.0;\n\n bool too_large = x > -threshold;\n bool too_small = x < threshold;\n\n float
result;\n float exp_x = exp(x);\n\n if (too_large){\n result = x;\n }\n else if (too_small){\n result = exp_x;\n
}\n else{\n result = log(exp_x + 1.0);\n }\n return result;\n`;\n\nexport const softplus =
unaryKernelFunc({opSnippet: SOFTPLUS});\n\nexport const softplusConfig: KernelConfig = {\n kernelName:
Softplus,\n backendName: 'webgl',\n kernelFunc: softplus,\n};\n", "/*\n * @license\n * Copyright 2020 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====
*\n\nimport {backend_util, KernelConfig, KernelFunc, SpaceToBatchND, SpaceToBatchNDAttrs,
SpaceToBatchNDInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'./backend_webgl';\n\nimport {padV2} from './PadV2';\n\nimport {reshape} from './Reshape';\n\nimport {transpose}
from './Transpose';\n\nexport const spaceToBatchND = (args: {\n inputs: SpaceToBatchNDInputs,\n backend:
MathBackendWebGL,\n attrs: SpaceToBatchNDAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} =
args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n util.assert(\n x.shape.length <= 4,\n () => 'spaceToBatchND for rank > 4 with a WebGL backend not ' +\n 'implemented yet');\n\n const prod =
blockShape.reduce((a, b) => a * b);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n
completePaddings.push(...paddings as Array<[number, number]>);\n\n for (let i = 1 + blockShape.length; i <
x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const toDispose = [];\n\n const paddedX =
padV2({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue: 0}\n });\n\n const

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reshapedPaddedShape =\n    backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const
permutedReshapedPaddedPermutation = backend_util.getPermuted(\n    reshapedPaddedShape.length,
blockShape.length, false);\n\n const flattenShape =\n    backend_util.getReshapedPermuted(paddedX.shape,
blockShape, prod, false);\n\n const reshapedPaddedX = reshape(\n    {inputs: {x: paddedX}, backend, attrs:
{shape: reshapedPaddedShape}});\n\n const paddedXT = transpose({\n    inputs: {x: reshapedPaddedX},\n
backend,\n    attrs: {perm: permutedReshapedPaddedPermutation}\n });\n\n const result =\n    reshape({inputs:
{x: paddedXT}, backend, attrs: {shape: flattenShape}});\n\n toDispose.push(paddedX);\n
toDispose.push(reshapedPaddedX);\n toDispose.push(paddedXT);\n\n toDispose.forEach(t =>
backend.disposeIntermediateTensorInfo(t));\n\n return result;\n});\n\nexport const spaceToBatchNDConfig:
KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'webgl',\n kernelFunc: spaceToBatchND as
{} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

```

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=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, SparseToDense, SparseToDenseAttrs,
SparseToDenseInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'./backend_webgl';\n\nimport {ScatterProgram} from './scatter_gpu';\n\nimport {reshape} from './Reshape';\n\nexport
function sparseToDense(args: {\n inputs: SparseToDenseInputs,\n backend: MathBackendWebGL,\n attrs:
SparseToDenseAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {sparseIndices,
sparseValues, defaultValue} = inputs;\n const {outputShape} = attrs;\n\n const {sliceRank, numUpdates, strides,
outputSize} =\n    backend_util.calculateShapes(sparseValues, sparseIndices, outputShape);\n\n const
sumDupeIndices = false;\n const program = new ScatterProgram(\n    numUpdates, sliceRank,
sparseIndices.shape.length,\n    sparseValues.shape.length, strides, [outputSize, 1], sumDupeIndices);\n\n const res
= backend.runWebGLProgram(\n    program, [sparseValues, sparseIndices, defaultValue],
sparseValues.dtype);\n\n const reshaped =\n    reshape({inputs: {x: res}, backend, attrs: {shape:
outputShape}});\n\n backend.disposeIntermediateTensorInfo(res);\n\n return reshaped;\n}\n\nexport const
sparseToDenseConfig: KernelConfig = {\n kernelName: SparseToDense,\n backendName: 'webgl',\n kernelFunc:
sparseToDense as {} as KernelFunc\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {backend_util, KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from './backend_webgl';\n\nimport {slice} from
'./Slice';\n\nexport function splitV(\n args:\n    {inputs: SplitVInputs, backend: MathBackendWebGL, attrs:
SplitVAttrs\n}): TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const
{numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n\n const xRank = x.shape.length;\n const begin = new
Array(xRank).fill(0);\n const size = x.shape.slice();\n\n return splitSizes.map(s => {\n const sliceSize =
[...size];\n sliceSize[$axis] = s;\n const sliceT =\n    slice({inputs: {x}, backend, attrs: {begin, size:
sliceSize}});\n begin[$axis] += s;\n return sliceT;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n

```

kernelName: SplitV,\n backendName: 'webgl',\n kernelFunc: splitV as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Sqrt } from '@tensorflow/tfjs-core';\nimport { unaryKernelFunc } from './kernel_utils/kernel_funcs_utils';\n\nconst Sqrt = `return sqrt(x);`\n\nexport const sqrt = unaryKernelFunc({ opSnippet: Sqrt });\n\nexport const sqrtConfig: KernelConfig = {\n  kernelName: Sqrt,\n  backendName: 'webgl',\n  kernelFunc: sqrt as { } as KernelFunc\n};\n", "/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, Square } from '@tensorflow/tfjs-core';\nimport { unaryKernelFunc } from './kernel_utils/kernel_funcs_utils';\n\nconst SQUARE = `return x * x;`\n\nexport const square = unaryKernelFunc({ opSnippet: SQUARE });\n\nexport const squareConfig: KernelConfig = {\n  kernelName: Square,\n  backendName: 'webgl',\n  kernelFunc: square,\n};\n", "/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { KernelConfig, KernelFunc, Step, StepAttrs, TensorInfo, UnaryInputs } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from './backend_webgl';\nimport { CHECK_NAN_SNIPPET, UnaryOpProgram } from './unaryop_gpu';\n\nexport function step(\n  { inputs, attrs, backend }:\n  { inputs: UnaryInputs, attrs: StepAttrs, backend: MathBackendWebGL }:\n  TensorInfo {\n    const { x } = inputs;\n    const opSnippet = CHECK_NAN_SNIPPET + `\n      return x > 0.0 ? 1.0 : float(${attrs.alpha});\n    `;\n    const program = new UnaryOpProgram(x.shape, opSnippet);\n    return backend.runWebGLProgram(program, [x], x.dtype);\n  }\n)\n\nexport const stepConfig: KernelConfig = {\n  kernelName: Step,\n  backendName: 'webgl',\n  kernelFunc: step as { } as KernelFunc,\n};\n", "/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

```
=====\n*\n\nimport { GPGPUProgram } from './gpgpu_math';\nimport { getCoordsDataType } from './shader_compiler';\n\nexport class StridedSliceProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n  constructor(begin: number[], strides: number[], size: number[]) {\n
```

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this.outputShape = size;\n  const rank = size.length;\n  const inputDtype = getCoordsDataType(size.length);\n  const dtype = getCoordsDataType(size.length);\n  let newCoords = "";\n  if (rank === 1) {\n    newCoords =\n    'coords * strides + begin';\n  } else {\n    let outputAxis = 0;\n    newCoords =\n    size.map((_, i) => {\n      outputAxis++;\n      return size.length === 1 ?\n      `coords * strides[${i}] + begin[${i}]` :\n      `coords[${outputAxis - 1}] * strides[${i}] + begin[${i}]`;\n    })\n    .join(',')\n  }\n  this.userCode = `\n  ${inputDtype} begin = ${inputDtype}(${begin});\n  ${inputDtype} strides =\n  ${inputDtype}(${strides});\n  void main() {\n    ${dtype} coords = getOutputCoords();\n    setOutput(getX(${newCoords}));\n  }\n  `;\n}\n\n",/*\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *  

http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n * OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n * governing permissions and\n * limitations under the License.\n *  

=====\n
*\n\nimport {buffer, KernelConfig, KernelFunc, Rank, slice_util, StridedSlice, StridedSliceAttrs,\nStridedSliceInputs, TensorBuffer, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport\n{MathBackendWebGL} from '../backend_webgl';\n\nimport {stridedSliceImplCPU} from\n'./kernel_utils/shared';\n\nimport {StridedSliceProgram} from './strided_slice_gpu';\n\nimport {reshape} from\n'./Reshape';\n\nimport {slice} from './Slice';\n\nexport function stridedSlice(args: {\n  inputs: StridedSliceInputs,\n  backend: MathBackendWebGL,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =\n  args;\n  const {x} = inputs;\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n  const {nonStrided, $begin, $strides, size,\n  newShape, outShape} =\n  slice_util.sliceInfo(\n    x.shape, begin, end, strides, beginMask, endMask,\n    ellipsisMask,\n    newAxisMask, shrinkAxisMask);\n  const $x = reshape({inputs: {x}, backend, attrs: {shape:\n  newShape}});\n  let result;\n  if (nonStrided) {\n    const sliced =\n    slice({inputs: {x: $x}, backend, attrs:\n  {begin: $begin, size}});\n    result = reshape({inputs: {x: sliced}, backend, attrs: {shape: outShape}});\n  }\n  backend.disposeIntermediateTensorInfo(sliced);\n  } else if (outShape.some(axis => axis === 0)) {\n    result =\n  backend.makeTensorInfo(outShape, x.dtype, []);\n  } else {\n    const shouldExecuteOnCPU =\n  backend.shouldExecuteOnCPU([$x]);\n    if (shouldExecuteOnCPU) {\n      const xTexData =\n  backend.texData.get($x.dataId);\n      const values = xTexData.values as TypedArray;\n      const xBuf =\n  buffer($x.shape, $x.dtype, values) as TensorBuffer<Rank>;\n      const resultValues =\n  stridedSliceImplCPU(outShape, xBuf, $strides, $begin);\n      result = backend.makeTensorInfo(outShape, $x.dtype,\n  resultValues.values);\n    } else {\n      const program = new StridedSliceProgram($begin, $strides, outShape);\n      result = backend.runWebGLProgram(program, [$x], $x.dtype);\n    }\n  }\n  const resultReshaped =\n  reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});\n  backend.disposeIntermediateTensorInfo($x);\n  backend.disposeIntermediateTensorInfo(result);\n  return\n  resultReshaped;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'webgl',\n  kernelFunc: stridedSlice as {} as KernelFunc\n};\n\n",/*\n * \n * @license\n * Copyright\n * 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * \n * you may not use this file except in compliance with the License.\n * \n * You may obtain a copy of the License at\n * \n * \n *  

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=====\n
*\n\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from\n'./kernel_utils/kernel_funcs_utils';\n\nconst TAN = `return tan(x);`\n\nexport const tan =

```

```

unaryKernelFunc({opSnippet: TAN});\n\nexport const tanConfig: KernelConfig = {\n  kernelName: Tan,\n  backendName: 'webgl',\n  kernelFunc: tan,\n};\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from './kernel_utils/kernel_funcs_utils';\nconst TANH = `float e2x = exp(-2.0 * abs(x));\nreturn sign(x) * (1.0 - e2x) / (1.0 + e2x);`\n\nexport const tanh = unaryKernelFunc({opSnippet: TANH});\n\nexport const tanhConfig: KernelConfig = {\n  kernelName: Tanh,\n  backendName: 'webgl',\n  kernelFunc: tanh,\n};\n\n"/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\nexport class TileProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  rank: number;\n\n  constructor(aShape: number[], reps: number[]) {\n    const outputShape: number[] = new Array(aShape.length);\n    for (let i = 0; i < outputShape.length; i++) {\n      outputShape[i] = aShape[i] * reps[i];\n    }\n    this.outputShape = outputShape;\n    this.rank = outputShape.length;\n    const dtype = getCoordsDataType(this.rank);\n    const sourceCoords = getSourceCoords(aShape);\n\n    this.userCode = `\n      void main() {\n        ${dtype} resRC = getOutputCoords();\n        setOutput(getA(${sourceCoords}));\n      }\n    `;\n  }\n\n  function getSourceCoords(aShape: number[]): string {\n    const rank = aShape.length;\n    if (rank > 5) {\n      throw Error(`Tile for rank ${rank} is not yet supported`);\n    }\n    if (rank === 1) {\n      return `imod(resRC, ${aShape[0]}`);\n    }\n\n    const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w', 'resRC.u'];\n\n    const sourceCoords = [];\n    for (let i = 0; i < aShape.length; i++) {\n      sourceCoords.push(`imod(${currentCoords[i]}, ${aShape[i]}`);\n    }\n\n    return sourceCoords.join();\n  }\n}\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {buffer, KernelConfig, KernelFunc, TensorInfo, Tile, TileAttrs, TileInputs, util} from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {tileImplCPU} from './kernel_utils/shared';\nimport {TileProgram} from './tile_gpu';\nexport function tile(\n  params: {\n    inputs: TileInputs,\n    backend: MathBackendWebGL,\n    attrs: TileAttrs,\n  }):\n  TensorInfo {\n  const {inputs, backend, attrs} = params;\n  const {x} = inputs;\n  const {reps} = attrs;\n\n  if (x.dtype === 'string') {\n    // Even though string tensor is always on CPU, just to be consistent on how\n    // to access tensor data.\n    const data = backend.readSync(x.dataId) as Uint8Array[];\n    const decodedData = data.map(d => util.decodeString(d));\n    const buf = buffer(x.shape, x.dtype, decodedData);\n    const outBuf = tileImplCPU(buf, reps);\n    return backend.makeTensorInfo(outBuf.shape, outBuf.dtype, outBuf.values);\n  }\n\n  const program = new

```



```
TileProgram(x.shape, reps);\n const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n return\n output;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'webgl',\n kernelFunc: tile as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, NumericDataType, TensorInfo, TopK, TopKAttrs, TopKInputs,\n TypedArray } from '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport\n { topKImplCPU } from '../kernel_utils/shared';\n\nexport function topK(\n  args: { inputs: TopKInputs, backend:\n MathBackendWebGL, attrs: TopKAttrs }):\n  TensorInfo[] {\n const { inputs, backend, attrs } = args;\n const { x } =\n inputs;\n const { k, sorted } = attrs;\n\n const xVals = backend.readSync(x.dataId) as TypedArray;\n const\n [allTopKVals, allTopKIndices] =\n topKImplCPU(xVals, x.shape, x.dtype as NumericDataType, k, sorted);\n\n return [\n backend.makeTensorInfo(\n allTopKVals.shape, allTopKVals.dtype, allTopKVals.values),\n backend.makeTensorInfo(\n allTopKIndices.shape, allTopKIndices.dtype, allTopKIndices.values)\n ];\n}\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'webgl',\n kernelFunc: topK as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All Rights\n Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR\n CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing\n permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unique, UniqueAttrs, UniqueInputs } from '@tensorflow/tfjs-\n core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { uniqueImplCPU } from\n '../kernel_utils/shared';\nimport { assertNotComplex } from '../webgl_util';\n\nexport function unique(\n  args:\n { inputs: UniqueInputs, attrs: UniqueAttrs, backend: MathBackendWebGL }):\n  TensorInfo[] {\n const { inputs,\n attrs, backend } = args;\n const { axis } = attrs;\n const { x } = inputs;\n assertNotComplex(x, 'unique');\n\n // For\n now, always forward calculation to the CPU backend.\n console.warn(\n 'WARNING: ',\n 'UI might be\n locked temporarily as data is being downloaded');\n const values = backend.readSync(x.dataId);\n const\n { outputValues, outputShape, indices } =\n uniqueImplCPU(values, axis, x.shape, x.dtype);\n return [\n backend.makeTensorInfo(outputShape, x.dtype, outputValues),\n backend.makeTensorInfo([indices.length,\n 'int32', indices),\n ];\n}\n\nexport const uniqueConfig: KernelConfig = {\n kernelName: Unique,\n backendName:\n 'webgl',\n kernelFunc: unique as {} as KernelFunc,\n};\n", "/*\n * @license\n * Copyright 2020 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *  
http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
```

```
=====\n\n*\n\nimport { KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs } from\n '@tensorflow/tfjs-core';\nimport { MathBackendWebGL } from '../backend_webgl';\nimport { reshape } from\n './Reshape';\nimport { slice } from './Slice';\n\nexport function unpack(\n  args:\n { inputs: UnpackInputs,
```

```

backend: MathBackendWebGL, attrs: UnpackAttrs});\n  TensorInfo[] {\n  const {inputs, backend, attrs} = args;\n  const {value} = inputs;\n  let {axis} = attrs;\n  \n  if (axis < 0) {\n    axis += value.shape.length;\n  }\n  \n  const x =\n  value;\n  const xRank = x.shape.length;\n  \n  const num = value.shape[axis];\n  const outShape: number[] = new\n  Array(xRank - 1);\n  let outIndex = 0;\n  for (let i = 0; i < xRank; i++) {\n    if (i !== axis) {\n      outShape[outIndex++] = x.shape[i];\n    }\n  }\n  \n  const toDispose = [];\n  const begin = new\n  Array(xRank).fill(0);\n  const size = x.shape.slice();\n  size[axis] = 1;\n  const res: TensorInfo[] = new\n  Array(num);\n  for (let i = 0; i < res.length; i++) {\n    begin[axis] = i;\n    const sliced = slice({inputs: {x}, backend,\n    attrs: {begin, size}});\n    const reshaped =\n    reshape({inputs: {x: sliced}, backend, attrs: {shape:\n    outShape}});\n    res[i] = reshaped;\n    toDispose.push(sliced);\n  }\n  \n  toDispose.forEach(t =>\n  backend.disposeIntermediateTensorInfo(t));\n  return res;\n}\n\nexport const unpackConfig: KernelConfig = {\n  kernelName: Unpack,\n  backendName: 'webgl',\n  kernelFunc: unpack as {} as KernelFunc\n};\n\n"/**\n *  

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law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for  

the specific language governing permissions and\n * limitations under the License.\n */

```

```

=====\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from\n './gpgpu_math';\n\nexport class SegmentOpProgram implements GPGPUProgram {\n  variableNames = ['x',\n 'segmentIds'];\n  outputShape: number[];\n  userCode: string;\n  \n  constructor(\n    segOpInfo:\n    backend_util.segment_util.SegOpInfo,\n    segOpType: 'unsortedSegmentSum') {\n    const windowSize =\n    segOpInfo.windowSize;\n    const batchSize = segOpInfo.batchSize;\n    const inSize = segOpInfo.inSize;\n    const\n    numSegments = segOpInfo.numSegments;\n    const outSize = numSegments * Math.ceil(inSize / windowSize);\n    this.outputShape = [batchSize, outSize];\n    \n    const initializationValue = '0.0';\n    const returnValue =\n    `sumValue`;\n    \n    const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n    const\n    windowSizeVec4Remainder = windowSize % 4;\n    \n    const updateSnippet = `\n    sumValue += dot(values,\n    segFilter);\n    `;\n    \n    let checkValueOutOfBounds = ";\n    if (inSize % windowSize > 0) {\n      checkValueOutOfBounds = `\n    if (inIdx < 0 || inIdx >= ${inSize}) {\n      return initializationValue;\n    }\n    `;\n    }\n    \n    let checkSegmentIdOutOfBounds = ";\n    if (inSize % windowSize > 0) {\n      checkSegmentIdOutOfBounds = `\n    if (inIdx < 0 || inIdx >= ${inSize}) {\n      return -1.0;\n    }\n    `;\n    }\n    \n    this.userCode = `\n    const float initializationValue = ${initializationValue};\n    float getValue(int\n    batch, int inIdx) {\n      ${checkValueOutOfBounds}\n      return getX(batch, inIdx);\n    }\n    float\n    getSegmentIdAtIndex(int inIdx) {\n      ${checkSegmentIdOutOfBounds}\n      return getSegmentIds(inIdx);\n    }\n    \n    void main() {\n      ivec2 coords = getOutputCoords();\n      int batch = coords[0];\n      int outIdx =\n      coords[1];\n      int inOffset = int(floor(float(outIdx) / float(\n      ${numSegments})) * float(${windowSize}));\n      int\n      currentSeg = int(mod(float(outIdx), float(${numSegments})));;\n      float sumValue = 0.0;\n      \n      for (int\n      i = 0; i < ${windowSizeNearestVec4}; i += 4) {\n        int inIdx = inOffset + i;\n        vec4 values = vec4(\n        getValue(batch, inIdx),\n        getValue(batch, inIdx + 1),\n        getValue(batch, inIdx + 2),\n        getValue(batch, inIdx + 3));\n        \n        vec4 segFilter = vec4(\n        int(getSegmentIdAtIndex(inIdx)) ==\n        currentSeg ? 1 : 0,\n        int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n        int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n        int(getSegmentIdAtIndex(inIdx + 3)) ==\n        currentSeg ? 1 : 0\n        );\n        \n        ${updateSnippet}\n        \n        int inIdx = inOffset +\n        ${windowSizeNearestVec4};\n        if (${windowSizeVec4Remainder} === 1) {\n          vec4 values = vec4(\n          getValue(batch, inIdx),\n          initializationValue,\n          initializationValue,\n          initializationValue\n          );\n          \n          int inIdxSeg = int(getSegmentIdAtIndex(inIdx));\n          \n          vec4 segFilter = vec4(\n          int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n          0,\n          0,\n          0\n          );\n          \n          ${updateSnippet}\n        } else if (${windowSizeVec4Remainder} === 2) {\n          vec4 values = vec4(\n

```

```

getValue(batch, inIdx),\n      getValue(batch, inIdx + 1),\n      initializationValue,\n      initializationValue\n    );\n\n    vec4 segFilter = vec4(\n      int(getSegmentIdAtIndex(inIdx)) ==\n      currentSeg ? 1 : 0,\n      int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n      0,\n      0\n    );\n\n    ${updateSnippet}\n  } else if (${windowSizeVec4Remainder === 3}) {\n    vec4 values =\n    vec4(\n      getValue(batch, inIdx),\n      getValue(batch, inIdx + 1),\n      getValue(batch, inIdx + 2),\n      initializationValue\n    );\n\n    vec4 segFilter = vec4(\n      int(getSegmentIdAtIndex(inIdx)) ==\n      currentSeg ? 1 : 0,\n      int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n      int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n      0\n    );\n\n    ${updateSnippet}\n  }\n  setOutput(${returnValue});\n}\n`;\n}\n\n", "/*\n * @license\n * Copyright 2020 Google LLC. All\n * Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *  

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=====\n
*\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, sumOutType, TensorInfo,\n  UnsortedSegmentSum, UnsortedSegmentSumAttrs, UnsortedSegmentSumInputs, util} from '@tensorflow/tfjs-\n  core';\n\nimport {MathBackendWebGL} from './backend_webgl';\nimport {SegmentOpProgram} from\n  './segment_gpu';\n\nimport {range} from './Range';\nimport {reshape} from './Reshape';\nimport {tile} from\n  './Tile';\nimport {transpose} from './Transpose';\n\nexport function unsortedSegmentSum(args: {\n  inputs:\n  UnsortedSegmentSumInputs,\n  backend: MathBackendWebGL,\n  attrs: UnsortedSegmentSumAttrs\n}):  

TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x, segmentIds} = inputs;\n  const {numSegments} =\n  attrs;\n\n  const xRank = x.shape.length;\n\n  const toDispose = [];\n\n  let axis = 0;\n  const permutation =\n  backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX\n  = transpose({inputs: {x}, backend, attrs: {perm: permutation}});\n    toDispose.push(permutedX);\n    axis =\n  backend_util.getInnerMostAxes(1, xRank)[0];\n  }\n\n  const outShape =\n  backend_util.segment_util.computeOutShape(\n    permutedX.shape, axis, numSegments);\n  const inSize =\n  util.sizeFromShape([permutedX.shape[axis]]);\n  const a2D =\n  reshape({inputs: {x: permutedX}, backend, attrs:\n  {shape: [-1, inSize]}});\n  toDispose.push(a2D);\n\n  const outputDType = sumOutType(x.dtype);\n  const\n  segOpCompute =\n  (x: TensorInfo, segOpType: 'unsortedSegmentSum', segmentIds: TensorInfo,\n  dtype:\n  DataType, numSegments: number): TensorInfo => {\n    const batchSize = x.shape[0];\n    const inSize =\n  x.shape[1];\n    const windowSize =\n  backend_util.segment_util.segOpComputeOptimalWindowSize(\n  inSize, numSegments);\n    const segOpInfo = {windowSize, inSize, batchSize, numSegments};\n\n    const program = new SegmentOpProgram(segOpInfo, segOpType);\n    const output =\n  backend.compileAndRun(program, [x, segmentIds], dtype);\n    toDispose.push(output);\n    // No need to run\n  another GPGPU program.\n    if (output.shape[1] === numSegments) {\n      return output;\n    }\n    const\n  rangeInfo = range({\n  backend,\n  attrs: {start: 0, stop: numSegments, step: 1, dtype: 'float32'}\n  });\n\n    const tileInfo = tile({\n  inputs: {x: rangeInfo},\n  backend,\n  attrs: {reps: [inSize /\n  windowSize]}\n  });\n\n    toDispose.push(rangeInfo);\n    toDispose.push(tileInfo);\n\n    const result =\n  segOpCompute(output, segOpType, tileInfo, dtype, numSegments);\n    return result;\n  };\n\n  const\n  segOpResult = segOpCompute(\n  a2D, 'unsortedSegmentSum', segmentIds, outputDType, numSegments);\n\n  const reshaped =\n  reshape({inputs: {x: segOpResult}, backend, attrs: {shape: outShape}});\n\n  let result =\n  reshaped;\n  if (permutation !== null) {\n    toDispose.push(reshaped);\n    const perm =\n  backend_util.getUndoAxesPermutation(permutation);\n    result = transpose({inputs: {x: result}, backend, attrs:\n  {perm}});\n  }\n\n  toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n  return\n  result;\n}\n\nexport const unsortedSegmentSumConfig: KernelConfig = {\n  kernelName: UnsortedSegmentSum,\n  backendName: 'webgl',\n  kernelFunc: unsortedSegmentSum as {} as KernelFunc\n};\n", "/*\n * @license\n *

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```
=====\n*\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\nimport {_fusedMatMulConfig} from  
 './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {acosConfig} from  
 './kernels/Acos';\nimport {acoshConfig} from './kernels/Acosh';\nimport {addConfig} from './kernels/Add';\nimport  
 {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from  
 './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {argMinConfig} from  
 './kernels/ArgMin';\nimport {asinConfig} from './kernels/Asin';\nimport {asinhConfig} from  
 './kernels/Asinh';\nimport {atanConfig} from './kernels/Atan';\nimport {atan2Config} from  
 './kernels/Atan2';\nimport {atanhConfig} from './kernels/Atanh';\nimport {avgPoolConfig} from  
 './kernels/AvgPool';\nimport {avgPool3DConfig} from './kernels/AvgPool3D';\nimport {avgPoolGrad3DConfig}  
 from './kernels/AvgPool3DGrad';\nimport {avgPoolGradConfig} from './kernels/AvgPoolGrad';\nimport  
 {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchNormConfig} from  
 './kernels/BatchNorm';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport  
 {bincountConfig} from './kernels/Bincount';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from  
 './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {complexConfig} from  
 './kernels/Complex';\nimport {complexAbsConfig} from './kernels/ComplexAbs';\nimport {concatConfig} from  
 './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropFilterConfig} from  
 './kernels/Conv2DBackpropFilter';\nimport {conv2DBackpropInputConfig} from  
 './kernels/Conv2DBackpropInput';\nimport {conv3DConfig} from './kernels/Conv3D';\nimport  
 {conv3DBackpropFilterV2Config} from './kernels/Conv3DBackpropFilterV2';\nimport  
 {conv3DBackpropInputConfig} from './kernels/Conv3DBackpropInputV2';\nimport {cosConfig} from  
 './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from  
 './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {denseBincountConfig}  
 from './kernels/DenseBincount';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport  
 {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport  
 {depthwiseConv2dNativeBackpropFilterConfig} from './kernels/DepthwiseConv2dNativeBackpropFilter';\nimport  
 {depthwiseConv2dNativeBackpropInputConfig} from './kernels/DepthwiseConv2dNativeBackpropInput';\nimport  
 {diagConfig} from './kernels/Diag';\nimport {dilation2DConfig} from './kernels/Dilation2D';\nimport {eluConfig}  
 from './kernels/Elu';\nimport {eluGradConfig} from './kernels/EluGrad';\nimport {equalConfig} from  
 './kernels/Equal';\nimport {erfConfig} from './kernels/Erf';\nimport {expConfig} from './kernels/Exp';\nimport  
 {expandDimsConfig} from './kernels/ExpandDims';\nimport {expm1Config} from './kernels/Expm1';\nimport  
 {fftConfig} from './kernels/FFT';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from  
 './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from  
 './kernels/FloorDiv';\nimport {fromPixelsConfig} from './kernels/FromPixels';\nimport {fusedConv2DConfig} from  
 './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from  
 './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport  
 {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport  
 {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport  
 {ifftConfig} from './kernels/IFFT';\nimport {imagConfig} from './kernels/Imag';\nimport {isFiniteConfig} from  
 './kernels/IsFinite';\nimport {isInfConfig} from './kernels/IsInf';\nimport {isNaNConfig} from  
 './kernels/IsNaN';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from  
 './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {linSpaceConfig} from
```

```

./kernels/LinSpace';\nimport {logConfig} from './kernels/Log';\nimport {log1pConfig} from
./kernels/Log1p';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {logicalNotConfig} from
./kernels/LogicalNot';\nimport {logicalOrConfig} from './kernels/LogicalOr';\nimport {LRNConfig} from
./kernels/LRN';\nimport {LRNGradConfig} from './kernels/LRNGrad';\nimport {maxConfig} from
./kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from
./kernels/MaxPool';\nimport {maxPool3DConfig} from './kernels/MaxPool3D';\nimport {maxPoolGrad3DConfig}
from './kernels/MaxPool3DGrad';\nimport {maxPoolGradConfig} from './kernels/MaxPoolGrad';\nimport
{maxPoolWithArgmaxConfig} from './kernels/MaxPoolWithArgmax';\nimport {meanConfig} from
./kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
./kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {modConfig} from
./kernels/Mod';\nimport {multinomialConfig} from './kernels/Multinomial';\nimport {multiplyConfig} from
./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realConfig} from './kernels/Real';\nimport {realDivConfig} from
./kernels/RealDiv';\nimport {reciprocalConfig} from './kernels/Reciprocal';\nimport {reluConfig} from
./kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
./kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport
{resizeBilinearGradConfig} from './kernels/ResizeBilinearGrad';\nimport {resizeNearestNeighborConfig} from
./kernels/ResizeNearestNeighbor';\nimport {resizeNearestNeighborGradConfig} from
./kernels/ResizeNearestNeighborGrad';\nimport {reverseConfig} from './kernels/Reverse';\nimport
{rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from
./kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {seluConfig} from
./kernels/Selu';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {signConfig} from
./kernels/Sign';\nimport {sinConfig} from './kernels/Sin';\nimport {sinhConfig} from './kernels/Sinh';\nimport
{sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {softplusConfig}
from './kernels/Softplus';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport
{sparseToDenseConfig} from './kernels/SparseToDense';\nimport {splitVConfig} from './kernels/SplitV';\nimport
{sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport
{squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport
{stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig}
from './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transposeConfig} from
./kernels/Transpose';\nimport {uniqueConfig} from './kernels/Unique';\nimport {unpackConfig} from
./kernels/Unpack';\nimport {unsortedSegmentSumConfig} from './kernels/UnsortedSegmentSum';\nimport
{zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs:
KernelConfig[] = [\n LRNConfig,\n LRNGradConfig,\n _fusedMatMulConfig,\n absConfig,\n acosConfig,\n
acoshConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n argMinConfig,\n
asinConfig,\n asinhConfig,\n atan2Config,\n atanConfig,\n atanhConfig,\n avgPool3DConfig,\n
avgPoolConfig,\n avgPoolGrad3DConfig,\n avgPoolGradConfig,\n batchMatMulConfig,\n batchNormConfig,\n
batchToSpaceNDConfig,\n bincountConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n
complexAbsConfig,\n complexConfig,\n concatConfig,\n conv2DBackpropFilterConfig,\n
conv2DBackpropInputConfig,\n conv2DConfig,\n conv3DBackpropFilterV2Config,\n

```

```

conv3DBackpropInputConfig,\n conv3DConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n
cumsumConfig,\n denseBincountConfig,\n depthToSpaceConfig,\n
depthwiseConv2dNativeBackpropFilterConfig,\n depthwiseConv2dNativeBackpropInputConfig,\n
depthwiseConv2dNativeConfig,\n diagConfig,\n dilation2DConfig,\n eluConfig,\n eluGradConfig,\n
equalConfig,\n erfConfig,\n expConfig,\n expandDimsConfig,\n expm1Config,\n fftConfig,\n fillConfig,\n
flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fromPixelsConfig,\n fusedConv2DConfig,\n
fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n
identityConfig,\n ifftConfig,\n imagConfig,\n isFiniteConfig,\n isInfConfig,\n isNaNConfig,\n
leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n linSpaceConfig,\n log1pConfig,\n logConfig,\n
logicalAndConfig,\n logicalNotConfig,\n logicalOrConfig,\n maxConfig,\n maxPool3DConfig,\n
maxPoolConfig,\n maxPoolGrad3DConfig,\n maxPoolGradConfig,\n maxPoolWithArgmaxConfig,\n
maximumConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n modConfig,\n
multinomialConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realConfig,\n realDivConfig,\n reciprocalConfig,\n relu6Config,\n reluConfig,\n reshapeConfig,\n
resizeBilinearConfig,\n resizeBilinearGradConfig,\n resizeNearestNeighborConfig,\n
resizeNearestNeighborGradConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n roundConfig,\n rsqrtConfig,\n
scatterNdConfig,\n selectConfig,\n seluConfig,\n sigmoidConfig,\n signConfig,\n sinConfig,\n sinhConfig,\n
sliceConfig,\n softmaxConfig,\n softplusConfig,\n spaceToBatchNDConfig,\n sparseToDenseConfig,\n
splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n
subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transposeConfig,\n
uniqueConfig,\n unpackConfig,\n unsortedSegmentSumConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig
of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n", "/*\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n *
=====\n
*/\n\n/** tslint:disable */\n\n/** Properties of an Any. */\n\nexport declare interface IAny {\n /** Any typeUrl */\n
typeUrl?: (string|null);\n\n /** Any value */\n value?: (Uint8Array|null);\n}\n\n/** DataType enum. */\n\nexport
enum DataType {\n 'DT_INVALID' = 0,\n 'DT_FLOAT' = 1,\n 'DT_DOUBLE' = 2,\n 'DT_INT32' = 3,\n
'DT_UINT8' = 4,\n 'DT_INT16' = 5,\n 'DT_INT8' = 6,\n 'DT_STRING' = 7,\n 'DT_COMPLEX64' = 8,\n
'DT_INT64' = 9,\n 'DT_BOOL' = 10,\n 'DT_QINT8' = 11,\n 'DT_QUINT8' = 12,\n 'DT_QINT32' = 13,\n
'DT_BFLOAT16' = 14,\n 'DT_FLOAT_REF' = 101,\n 'DT_DOUBLE_REF' = 102,\n 'DT_INT32_REF' = 103,\n
'DT_UINT8_REF' = 104,\n 'DT_INT16_REF' = 105,\n 'DT_INT8_REF' = 106,\n 'DT_STRING_REF' = 107,\n
'DT_COMPLEX64_REF' = 108,\n 'DT_INT64_REF' = 109,\n 'DT_BOOL_REF' = 110,\n 'DT_QINT8_REF' =
111,\n 'DT_QUINT8_REF' = 112,\n 'DT_QINT32_REF' = 113,\n 'DT_BFLOAT16_REF' = 114\n}\n\n/**
Properties of a TensorShape. */\n\nexport declare interface ITensorShape {\n /** TensorShape dim */\n dim?:
(TensorShape.IDim[]|null);\n\n /** TensorShape unknownRank */\n unknownRank?: (boolean|null);\n}\n\nexport
namespace TensorShape {\n /** Properties of a Dim. */\n\n export declare interface IDim {\n /** Dim size */\n
size?: (number|string|null);\n\n /** Dim name */\n name?: (string|null);\n }\n}\n\n/** Properties of a Tensor.
*/\n\nexport declare interface ITensor {\n /** Tensor dtype */\n dtype?: (DataType|null);\n\n /** Tensor tensorShape
*/\n tensorShape?: (ITensorShape|null);\n\n /** Tensor versionNumber */\n versionNumber?: (number|null);\n\n
/** Tensor tensorContent */\n tensorContent?: (Uint8Array|null);\n\n /** Tensor floatVal */\n floatVal?:
(number[]|null);\n\n /** Tensor doubleVal */\n doubleVal?: (number[]|null);\n\n /** Tensor intVal */\n intVal?:

```



```

(string|null);\n\n /** CooSparse denseShapeTensorName *\n denseShapeTensorName?: (string|null);\n
}\n}\n\n/** Properties of a SignatureDef. *\nexport declare interface ISignatureDef {\n /** SignatureDef inputs
*\n inputs?: ({[k: string]: ITensorInfo}|null);\n\n /** SignatureDef outputs *\n outputs?: ({[k: string]:
ITensorInfo}|null);\n\n /** SignatureDef methodName *\n methodName?: (string|null);\n}\n}\n\n/** Properties of an
AssetFileDef. *\nexport declare interface IAssetFileDef {\n /** AssetFileDef tensorInfo *\n tensorInfo?:
(ITensorInfo|null);\n\n /** AssetFileDef filename *\n filename?: (string|null);\n}\n}\n\n/** Properties of an OpDef.
*\nexport declare interface IOpDef {\n /** OpDef name *\n name?: (string|null);\n\n /** OpDef inputArg *\n
inputArg?: (OpDef.IArgDef[]|null);\n\n /** OpDef outputArg *\n outputArg?: (OpDef.IArgDef[]|null);\n\n /**
OpDef attr *\n attr?: (OpDef.IAttrDef[]|null);\n\n /** OpDef deprecation *\n deprecation?:
(OpDef.IOpDeprecation|null);\n\n /** OpDef summary *\n summary?: (string|null);\n\n /** OpDef description
*\n description?: (string|null);\n\n /** OpDef isCommutative *\n isCommutative?: (boolean|null);\n\n /** OpDef
isAggregate *\n isAggregate?: (boolean|null);\n\n /** OpDef isStateful *\n isStateful?: (boolean|null);\n\n /**
OpDef allowsUninitializedInput *\n allowsUninitializedInput?: (boolean|null);\n}\n}\n\nexport namespace OpDef {\n
/** Properties of an ArgDef. *\n export declare interface IArgDef {\n /** ArgDef name *\n name?:
(string|null);\n\n /** ArgDef description *\n description?: (string|null);\n\n /** ArgDef type *\n type?:
(DataType|null);\n\n /** ArgDef typeAttr *\n typeAttr?: (string|null);\n\n /** ArgDef numberAttr *\n
numberAttr?: (string|null);\n\n /** ArgDef typeListAttr *\n typeListAttr?: (string|null);\n\n /** ArgDef isRef
*\n isRef?: (boolean|null);\n }\n}\n\n /** Properties of an AttrDef. *\n export declare interface IAttrDef {\n /**
AttrDef name *\n name?: (string|null);\n\n /** AttrDef type *\n type?: (string|null);\n\n /** AttrDef
defaultValue *\n defaultValue?: (IAttrValue|null);\n\n /** AttrDef description *\n description?:
(string|null);\n\n /** AttrDef hasMinimum *\n hasMinimum?: (boolean|null);\n\n /** AttrDef minimum *\n
minimum?: (number|string|null);\n\n /** AttrDef allowedValues *\n allowedValues?: (IAttrValue|null);\n }\n}\n\n
/** Properties of an OpDeprecation. *\n export declare interface IOpDeprecation {\n /** OpDeprecation version
*\n version?: (number|null);\n\n /** OpDeprecation explanation *\n explanation?: (string|null);\n }\n}\n}\n\n/**
Properties of an OpList. *\nexport declare interface IOpList {\n /** OpList op *\n op?: (IOpDef[]|null);\n}\n}\n\n/**
Properties of a MetaGraphDef. *\nexport declare interface IMetaGraphDef {\n /** MetaGraphDef metaInfoDef
*\n metaInfoDef?: (MetaGraphDef.IMetaInfoDef|null);\n\n /** MetaGraphDef graphDef *\n graphDef?:
(IGraphDef|null);\n\n /** MetaGraphDef saverDef *\n saverDef?: (ISaverDef|null);\n\n /** MetaGraphDef
collectionDef *\n collectionDef?: ({[k: string]: ICollectionDef}|null);\n\n /** MetaGraphDef signatureDef *\n
signatureDef?: ({[k: string]: ISignatureDef}|null);\n\n /** MetaGraphDef assetFileDef *\n assetFileDef?:
(IAssetFileDef[]|null);\n}\n}\n\nexport namespace MetaGraphDef {\n /** Properties of a MetaInfoDef. *\n export
declare interface IMetaInfoDef {\n /** MetaInfoDef metaGraphVersion *\n metaGraphVersion?:
(string|null);\n\n /** MetaInfoDef strippedOpList *\n strippedOpList?: (IOpList|null);\n\n /** MetaInfoDef
anyInfo *\n anyInfo?: (IAny|null);\n\n /** MetaInfoDef tags *\n tags?: (string[]|null);\n\n /** MetaInfoDef
tensorflowVersion *\n tensorflowVersion?: (string|null);\n\n /** MetaInfoDef tensorflowGitVersion *\n
tensorflowGitVersion?: (string|null);\n }\n}\n}\n\n/** Properties of a SavedModel. *\nexport declare interface
ISavedModel {\n /** SavedModel savedModelSchemaVersion *\n savedModelSchemaVersion?:
(number|string|null);\n\n /** SavedModel metaGraphs *\n metaGraphs?: (IMetaGraphDef[]|null);\n}\n}\n\n/**
Properties of a FunctionDefLibrary. *\nexport declare interface IFunctionDefLibrary {\n /** FunctionDefLibrary
function *\n 'function': (IFunctionDef[]|null);\n\n /** FunctionDefLibrary gradient *\n gradient?:
(IGradientDef[]|null);\n}\n}\n\n/** Properties of a FunctionDef. *\nexport declare interface IFunctionDef {\n /**
FunctionDef signature *\n signature?: (IOpDef|null);\n\n /** FunctionDef attr *\n attr?: ({[k: string]:
IAttrValue}|null);\n\n /** FunctionDef nodeDef *\n nodeDef?: (INodeDef[]|null);\n\n /** FunctionDef ret *\n
ret?: ({[k: string]: string}|null);\n}\n}\n\n/** Properties of a GradientDef. *\nexport declare interface IGradientDef {\n
/** GradientDef functionName *\n functionName?: (string|null);\n\n /** GradientDef gradientFunc *\n
gradientFunc?: (string|null);\n}\n}\n\n"*\n*\n @license*\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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```


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```
=====
import {OpExecutor, OpMapper} from './types';
const CUSTOM_OPS: {[key: string]: OpMapper} =
{};

Register an Op for graph model executor. This allow you to register TensorFlow custom op or
override existing op. Here is an example of registering a new MatMul Op.

const customMatmul = (node) => {
  tf.matmul(node.inputs[0], node.inputs[1], {
    transpose_a: node.attrs['transpose_a'],
    transpose_b: node.attrs['transpose_b'];
  });
  tf.registerOp('MatMul', customMatmul);
};

The inputs and attrs of the node object is based on the TensorFlow registry.

@param name The Tensorflow Op name.
@param opFunc An op function which is called with the current graph node during execution and needs to
return a tensor or a list of tensors. The node has the following attributes:
- attr: A map from attribute name to its value
- inputs: A list of input tensors
@doc {heading: 'Models', subheading: 'Op Registry'}

export function registerOp(name: string, opFunc: OpExecutor) {
  const opMapper: OpMapper = {
    tfOpName: name,
    category: 'custom',
    inputs: [],
    attrs: [],
    customExecutor: opFunc
  };
  CUSTOM_OPS[name] = opMapper;
}

Retrieve the OpMapper object for the registered op.

@param name The Tensorflow Op name.
@doc {heading: 'Models', subheading: 'Op Registry'}

export function getRegisteredOp(name: string): OpMapper {
  return CUSTOM_OPS[name];
}

Deregister the Op for graph model executor.

@param name The Tensorflow Op name.
@doc {heading: 'Models', subheading: 'Op Registry'}

export function deregisterOp(name: string) {
  delete CUSTOM_OPS[name];
}

"/*
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```

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```
=====
import {clone, Tensor, util} from '@tensorflow/tfjs-core';
import {NamedTensorsMap} from '././data/types';
import {ExecutionContext} from '././executor/execution_context';
import {ResourceManager} from '././executor/resource_manager';
import {Node, ValueType} from './types';

export function getParamValue(
  paramName: string, node: Node, tensorMap: NamedTensorsMap,
  context: ExecutionContext, resourceManager?: ResourceManager): ValueType {
  const inputParam = node.inputParams[paramName];
  if (inputParam && inputParam.inputIndexStart !== undefined) {
    const start = inputParam.inputIndexStart;
    const end = inputParam.inputIndexEnd === 0 ?
      (inputParam.inputIndexEnd === undefined ? start + 1 :
        inputParam.inputIndexEnd) :
      inputParam.inputIndexEnd;
    if (inputParam.type === 'tensor') {
      return getTensor(
        node.inputNames[inputParam.inputIndexStart], tensorMap, context,
        resourceManager);
    }
    if (inputParam.type === 'tensors') {
      const inputs = node.inputNames.slice(start, end);
      return inputs.map(
        name => getTensor(name, tensorMap, context, resourceManager));
    }
    const tensor = getTensor(
      node.inputNames.slice(start)[0], tensorMap, context, resourceManager);
    const data = tensor.dataSync();
    return inputParam.type === 'number' ?
      data[0] : util.toNestedArray(tensor.shape, data);
  }
  const attrParam = node.attrParams[paramName];
  return attrParam && attrParam.value;
}

Retrieve the tensor from tensorsMap based on input name.

@param name Node input name
@param tensorsMap Tensors map keyed by the node
@param context contains tensors and information for running the current node.
@param resourceManager Optional. Contains global resources of the model.

export function getTensor(
  name: string, tensorsMap: NamedTensorsMap, context: ExecutionContext,
  resourceManager?:

```

```

ResourceManager): Tensor {\n  const [nodeName, index] = parseNodeName(name);\n\n  if (resourceManager !=\n  null) {\n    const tensor = resourceManager.getHashTableHandleByName(nodeName);\n    if (tensor != null) {\n      return tensor;\n    }\n  }\n\n  const contextId = context.currentContextIds.find(contextId => {\n    return\n    !!tensorsMap[getNodeNameWithContextId(nodeName, contextId)];\n  });\n\n  return contextId !== undefined ?\n  tensorsMap[getNodeNameWithContextId(nodeName, contextId)][index] :\n  undefined;\n}\n\n/**\n * Retrieve the tensors based on input name for current context.\n * @param name Node input name\n * @param tensorsMap Tensors map keyed by the node\n * @nexport function getTensorsForCurrentContext(\n  name: string, tensorsMap:\n  NamedTensorsMap,\n  context: ExecutionContext): Tensor[] {\n  return\n  tensorsMap[getNodeNameWithContextId(name, context.currentContextId)];\n}\n\n/**\n * Returns the node name and index from the Node input name.\n * @param inputName The input name of the node, in format of\n * node_name:output_index, i.e. MatMul:0, if the output_index is not set, it is\n * default to 0.\n * @nexport function getNodeNameAndIndex(\n  inputName: string, context?: ExecutionContext): [string, number] {\n  const\n  [nodeName, index] = parseNodeName(inputName);\n\n  return [\n    getNodeNameWithContextId(nodeName,\n    context && context.currentContextId),\n    index\n  ];\n}\n\nfunction getNodeNameWithContextId(name: string,\n  contextId?: string): string {\n  return !!contextId ? `${name}-${contextId}` : name;\n}\n\nexport function\n  parseNodeName(name: string): [string, number] {\n  const parts = name.split(':');\n  if (parts.length === 1) {\n    return [name, 0];\n  }\n\n  const nodeName = parts[0];\n  return [nodeName, Number(parts[parts.length -\n  1])];\n}\n\nexport function split(arr: number[], size: number) {\n  const res = [];\n  for (let i = 0; i < arr.length; i +=\n  size) {\n    res.push(arr.slice(i, i + size));\n  }\n  return res;\n}\n\nexport function getPadding(\n  node: Node,\n  tensorMap: NamedTensorsMap,\n  context: ExecutionContext): ValueType {\n  let pad = getParamValue('pad',\n  node, tensorMap, context);\n  if (pad === 'explicit') {\n    // This is 1d array, we need to convert it to 2d array\n    pad = getParamValue('explicitPaddings', node, tensorMap, context);\n    const explicitPadding: [\n      number,\n      number], [number, number], [number, number], [number, number]\n      ] = [[0, 0], [0, 0], [0, 0], [0, 0]]; \n    for (let i = 0; i < 4; i++) {\n      explicitPadding[i][0] = (pad as number[])[i * 2];\n      explicitPadding[i][1] = (pad as\n      number[])[i * 2 + 1];\n    }\n    return explicitPadding;\n  }\n  return pad;\n}\n\n/**\n * Reuse the tensor if it is marked as keep, otherwise clone the tensor to\n * avoid disposal. This is important for TensorArray and TensorList\n  ops, since\n * internally they use a tensor as the id for TensorArray and TensorList, and\n * to simplify lookup, they also use Tensor.id as the key to the internal map.\n * These id tensors have been marked as kept in the backend, we\n  need avoid clone\n * them in order to create new Tensor.id.\n * @param tensor\n * @nexport function\n  cloneTensor(tensor: Tensor): Tensor {\n  return tensor.kept ? tensor : clone(tensor);\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n  agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n  limitations under the License.\n *

```

```

=====\n\n*\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n  {\n    'tfOpName': 'Add',\n    'category': 'arithmetic',\n    'inputs': [\n      {'start': 0, 'name': 'a', 'type': 'tensor'},\n      {'start': 1, 'name': 'b', 'type':\n      'tensor'},\n    ],\n    'attrs': [\n      {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n    ],\n    {\n      'tfOpName': 'AddV2',\n      'category': 'arithmetic',\n      'inputs': [\n        {'start': 0, 'name': 'a', 'type': 'tensor'},\n        {'start': 1, 'name': 'b', 'type': 'tensor'},\n      ],\n      'attrs': [\n        {'tfName': 'T', 'name': 'dtype', 'type': 'dtype',\n        'notSupported': true}\n      ],\n      {\n        'tfOpName': 'AddN',\n        'category': 'arithmetic',\n        'inputs': [{ 'start': 0, 'end':\n        0, 'name': 'tensors', 'type': 'tensors'}]\n      },\n      {\n        'tfOpName': 'BiasAdd',\n        'category': 'arithmetic',\n        'inputs': [\n          {'start': 0, 'name': 'a', 'type': 'tensor'},\n          {'start': 1, 'name': 'b', 'type': 'tensor'},\n        ],\n        'attrs': [\n          {'tfName':\n          'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n          {'tfName': 'data_format',\n          'name': 'dataFormat',\n          'type': 'string',\n          'notSupported': true}\n        ],\n        {\n          'tfOpName': 'Sub',\n          'category': 'arithmetic',\n          'inputs': [\n            {'start': 0, 'name': 'a', 'type': 'tensor'},\n            {'start': 1, 'name': 'b', 'type': 'tensor'},\n          ],\n          'attrs': [\n

```

```
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*\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'AvgPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName':\n 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName':\n 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {'tfName':\n 'ksize', 'name': 'kernelSize', 'type': 'number[]'},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n true\n }]\n },\n {\n 'tfOpName': 'MaxPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x',\n 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName':\n 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type':\n 'string',\n 'notSupported': true\n },\n {'tfName': 'ksize', 'name': 'kernelSize', 'type': 'number[]'},\n {\n 'tfName': 'explicit_paddings',\n 'name': 'explicitPaddings',\n 'type': 'number[]',\n 'defaultValue': [],\n 'notSupported': true\n },\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'MaxPoolWithArgmax',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type':\n 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding',\n 'name': 'pad', 'type': 'string'},\n {'tfName': 'ksize', 'name': 'kernelSize', 'type': 'number[]'},\n {\n 'tfName':\n 'include_batch_in_index',\n 'name': 'includeBatchInIndex',\n 'type': 'bool'\n },\n {'tfName': 'T', 'name':\n 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'AvgPool3D',\n 'category':\n 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'strides',\n 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n {\n 'tfName':\n 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {'tfName':\n 'ksize', 'name': 'kernelSize', 'type': 'number[]'},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n true\n }\n }\n ]\n ]\n];
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true}\n  ]\n },\n {\n  'tfOpName': 'MaxPool3D',\n  'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name':
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    {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n  ]\n },\n {\n  'tfOpName': 'Conv1D',\n
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'tensor'},\n  ],\n  'attrs': [\n    {'tfName': 'stride', 'name': 'stride', 'type': 'number'},\n    {'tfName': 'padding', 'name':
'pad', 'type': 'string'},\n    {'tfName': 'data_format', 'name': 'dataFormat',\n  'type': 'string',\n  'defaultValue': 'NWC'\n  },\n    {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n    {\n
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'tfOpName': 'Conv2D',\n  'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n
    {'start': 1, 'name': 'filter', 'type': 'tensor'},\n  ],\n  'attrs': [\n    {'tfName': 'T', 'name': 'dtype', 'type': 'dtype',
'notSupported': true},\n    {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n    {'tfName': 'padding', 'name':
'pad', 'type': 'string'},\n    {'tfName': 'useCudnnOnGpu', 'name': 'useCudnnOnGpu', 'type': 'bool'},\n    {\n
'tfName': 'data_format',\n    'name': 'dataFormat',\n    'type': 'string',\n    'defaultValue': 'NHWC'\n  },\n    {\n
'tfName': 'explicit_paddings',\n    'name': 'explicitPaddings',\n    'type': 'number[]',\n    'defaultValue': []\n  },\n
    {'tfName': 'dilations', 'name': 'dilations', 'type': 'number[]'}\n  ]\n },\n {\n  'tfOpName': '_FusedConv2D',\n
'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'filter',
'type': 'tensor'},\n    {'start': 2, end: 0, 'name': 'args', 'type': 'tensors'},\n  ],\n  'attrs': [\n    {'tfName': 'num_args',
'name': 'numArgs', 'type': 'number'},\n    {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n
    {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n    {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n
    {'tfName': 'explicit_paddings',\n    'name': 'explicitPaddings',\n    'type': 'number[]',\n    'defaultValue': []\n  },\n
    {\n    'tfName': 'use_cudnn_on_gpu',\n    'name': 'useCudnnOnGpu',\n    'type': 'bool',\n    'defaultValue': true\n  },\n
    {\n    'tfName': 'data_format',\n    'name': 'dataFormat',\n    'type': 'string',\n    'defaultValue': 'NHWC'\n  },\n
    {\n    'tfName': 'dilations',\n    'name': 'dilations',\n    'type': 'number[]',\n    'defaultValue': [1, 1, 1, 1]\n  },\n
    {\n    'tfName': 'fused_ops',\n    'name': 'fusedOps',\n    'type':
'string[]',\n    'defaultValue': []\n  },\n    {\n    'tfName': 'epsilon',\n    'name': 'epsilon',\n    'type':
'number',\n    'defaultValue': 0.0001\n  },\n    {\n    'tfName': 'leakyrelu_alpha',\n    'name':
'leakyreluAlpha',\n    'type': 'number'\n  }\n  ]\n },\n {\n  'tfOpName': 'Conv2DBackpropInput',\n
'category': 'convolution',\n  'inputs': [\n    {'start': 2, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'filter', 'type':
'tensor'},\n    {'start': 0, 'name': 'outputShape', 'type': 'number[]'},\n  ],\n  'attrs': [\n    {'tfName': 'strides', 'name':
'strides', 'type': 'number[]'},\n    {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n    {'tfName': 'data_format',\n
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'explicit_paddings',\n    'name': 'explicitPaddings',\n    'type': 'number[]',\n    'defaultValue': []\n  },\n    {\n
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'tfOpName': 'DepthwiseConv2d',\n  'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name': 'input',
'type': 'tensor'},\n    {'start': 1, 'name': 'filter', 'type': 'tensor'},\n  ],\n  'attrs': [\n    {'tfName': 'strides', 'name':
'strides', 'type': 'number[]'},\n    {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n    {'tfName': 'data_format',\n
'name': 'dataFormat',\n    'type': 'string',\n    'defaultValue': 'NHWC'\n  },\n    {\n    'tfName':
'explicit_paddings',\n    'name': 'explicitPaddings',\n    'type': 'number[]',\n    'defaultValue': []\n  },\n
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'DepthwiseConv2dNative',\n  'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name': 'input', 'type':
'tensor'},\n    {'start': 1, 'name': 'filter', 'type': 'tensor'},\n  ],\n  'attrs': [\n    {'tfName': 'strides', 'name':
'strides', 'type': 'number[]'},\n    {'tfName': 'padding', 'name': 'pad', 'type': 'string'},\n    {'tfName': 'data_format',\n
'name': 'dataFormat',\n    'type': 'string',\n    'defaultValue': 'NHWC'\n  },\n    {\n    'tfName':
'explicit_paddings',\n    'name': 'explicitPaddings',\n    'type': 'number[]',\n    'defaultValue': []\n  },\n
    {'tfName': 'dilations', 'name': 'dilations', 'type': 'number[]'}\n  ]\n },\n {\n  'tfOpName':
'FusedDepthwiseConv2dNative',\n  'category': 'convolution',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type':

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'tensor'},\n    {'start': 1, 'name': 'filter', 'type': 'tensor'},\n    {'start': 2, end: 0, 'name': 'args', 'type': 'tensors'},\n    ],\n    'attrs': [\n        {'tfName': 'num_args', 'name': 'numArgs', 'type': 'number'},\n        {'tfName': 'T', 'name': 'dtype', 'type':\n'dtype', 'notSupported': true},\n        {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n        {'tfName': 'padding',\n'name': 'pad', 'type': 'string'},\n        {'tfName': 'data_format',\n        'name': 'dataFormat',\n        'type': 'string'},\n        {'defaultValue': 'NHWC'},\n        {'tfName': 'dilations',\n        'name': 'dilations',\n        'type': 'number[]',\n        'defaultValue': [1, 1, 1, 1]},\n        {'tfName': 'fused_ops',\n        'name': 'fusedOps',\n        'type':\n'string[]',\n        'defaultValue': []},\n        {'tfName': 'explicit_paddings',\n        'name':\n'explicitPaddings',\n        'type': 'number[]',\n        'defaultValue': []}\n    ]\n},\n {\n    'tfOpName': 'Conv3D',\n    'category': 'convolution',\n    'inputs': [\n        {'start': 0, 'name': 'x', 'type': 'tensor'},\n        {'start': 1, 'name': 'filter',\n'type': 'tensor'},\n    ],\n    'attrs': [\n        {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n        {'tfName':\n'padding', 'name': 'pad', 'type': 'string'},\n        {'tfName': 'data_format',\n        'name': 'dataFormat',\n        'type':\n'string',\n        'defaultValue': 'NHWC'},\n        {'tfName': 'dilations', 'name': 'dilations', 'type': 'number[]'}\n    ],\n {\n    'tfOpName': 'Dilation2D',\n    'category': 'convolution',\n    'inputs': [\n        {'start': 0, 'name': 'x', 'type':\n'tensor'},\n        {'start': 1, 'name': 'filter', 'type': 'tensor'},\n    ],\n    'attrs': [\n        {'tfName': 'strides', 'name': 'strides',\n'type': 'number[]'},\n        {'tfName': 'rates', 'name': 'dilations', 'type': 'number[]'},\n        {'tfName': 'padding', 'name':\n'pad', 'type': 'string'}\n    ]\n}\n];\n\n", "import {OpMapper} from '../types';\n\n**\n * @license\n * Copyright 2018\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you\n may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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*\n\nexport const json: OpMapper[] = [\n {\n    'tfOpName': 'Fill',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'shape', 'type': 'number[]'},\n        {'start': 1, 'name': 'value', 'type': 'number'},\n    ],\n    'attrs':\n    [{\n        'tfName': 'T', 'name': 'dtype', 'type': 'dtype'}\n    ]\n},\n {\n    'tfOpName': 'LinSpace',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'start', 'type': 'number'},\n        {'start': 1, 'name': 'stop', 'type': 'number'},\n        {'start':\n2, 'name': 'num', 'type': 'number'},\n    ],\n    'attrs': [\n        {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\ntrue}\n    ]\n},\n {\n    'tfOpName': 'OneHot',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name':\n'indices', 'type': 'tensor'},\n        {'start': 1, 'name': 'depth', 'type': 'number'},\n        {'start': 2, 'name': 'onValue', 'type':\n'number', 'defaultValue': 1},\n        {'start': 3, 'name': 'offValue', 'type': 'number', 'defaultValue': 0},\n    ],\n    'attrs': [\n        {\n            'tfName': 'axis',\n            'name': 'axis',\n            'type': 'number',\n            'notSupported': true\n        },\n        {\n            'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n        }\n    ]\n},\n {\n    'tfOpName': 'Ones',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'shape', 'type': 'number[]'},\n    ],\n    'attrs': [{\n        'tfName': 'T',\n        'name': 'dtype', 'type': 'dtype'}\n    ]\n},\n {\n    'tfOpName': 'OnesLike',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'x', 'type': 'tensor'},\n    ],\n    'attrs': [{\n        'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'}\n    ]\n},\n {\n    'tfOpName': 'RandomUniform',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'shape', 'type':\n'number[]'},\n    ],\n    'attrs': [\n        {\n            'tfName': 'minval',\n            'name': 'minval',\n            'type': 'number',\n            'defaultValue': 0\n        },\n        {\n            'tfName': 'maxval',\n            'name': 'maxval',\n            'type': 'number',\n            'defaultValue': 1\n        },\n        {\n            'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'},\n        {\n            'tfName': 'seed', 'name': 'seed',\n            'type': 'number', 'defaultValue': 0\n        },\n        {\n            'tfName': 'seed2',\n            'name': 'seed2',\n            'type': 'number',\n            'defaultValue': 0,\n            'notSupported': true\n        },\n        {\n            'tfName': 'T', 'name': 'T', 'type': 'number', 'notSupported':\ntrue\n        }\n    ]\n},\n {\n    'tfOpName': 'Range',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'start',\n'type': 'number'},\n        {'start': 1, 'name': 'stop', 'type': 'number'},\n        {'start': 2, 'name': 'step', 'type': 'number',\n'defaultValue': 0},\n    ],\n    'attrs': [{\n        'tfName': 'Tidx', 'name': 'dtype', 'type': 'dtype'}\n    ]\n},\n {\n    'tfOpName':\n'TruncatedNormal',\n    'category': 'creation',\n    'inputs': [\n        {'start': 0, 'name': 'shape', 'type': 'number[]'},\n    ],\n    'attrs': [\n        {\n            'tfName': 'means',\n            'name': 'mean',\n            'type': 'number',\n            'defaultValue': 0.0\n        },\n        {\n            'tfName': 'stddev',\n            'name': 'stdDev',\n            'type': 'number',\n            'defaultValue': 1.0\n        },\n    ]\n}

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},\n {\n  'tfOpName': 'Multinomial',\n  'category': 'creation',\n  'inputs': [\n    {'start': 0, 'name': 'logits', 'type':
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'type': 'dtype'},\n    {'tfName': 'output_dtype', 'name': 'output_dtype', 'type': 'dtype'}\n  ]\n }\n ];\n",\n"import
{OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nexport const json: OpMapper[] = [\n  {\n    'tfOpName': 'NonMaxSuppressionV2',\n    'category': 'dynamic',\n
'inputs': [\n    {'start': 0, 'name': 'boxes', 'type': 'tensor'},\n    {'start': 1, 'name': 'scores', 'type': 'tensor'},\n    {'start':
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'tfOpName': 'NonMaxSuppressionV3',\n  'category': 'dynamic',\n  'inputs': [\n    {'start': 0, 'name': 'boxes', 'type':
'tensor'},\n    {'start': 1, 'name': 'scores', 'type': 'tensor'},\n    {'start': 2, 'name': 'maxOutputSize', 'type': 'number'},\n
    {'start': 3, 'name': 'iouThreshold', 'type': 'number'},\n    {'start': 4, 'name': 'scoreThreshold', 'type': 'number'}\n  ]\n
},\n  {\n    'tfOpName': 'NonMaxSuppressionV4',\n    'category': 'dynamic',\n    'inputs': [\n    {'start': 0, 'name':
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'type': 'number'},\n    {'start': 3, 'name': 'iouThreshold', 'type': 'number'},\n    {'start': 4, 'name': 'scoreThreshold',
'type': 'number'}\n  ],\n  'attrs': [\n    {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true},\n    {\n
'tfName': 'T_threshold',\n    'name': 'threshold',\n    'type': 'dtype',\n    'notSupported': true\n    },\n    {\n
'tfName': 'pad_to_max_output_size',\n    'name': 'padToMaxOutputSize',\n    'type': 'bool'\n    }\n  ]\n },\n  {\n
'tfOpName': 'NonMaxSuppressionV5',\n  'category': 'dynamic',\n  'inputs': [\n    {'start': 0, 'name': 'boxes',
'type': 'tensor'},\n    {'start': 1, 'name': 'scores', 'type': 'tensor'},\n    {'start': 2, 'name': 'maxOutputSize', 'type':
'number'},\n    {'start': 3, 'name': 'iouThreshold', 'type': 'number'},\n    {'start': 4, 'name': 'scoreThreshold', 'type':
'number'},\n    {'start': 5, 'name': 'softNmsSigma', 'type': 'number'}\n  ]\n },\n  {\n    'tfOpName': 'Where',\n    'category':
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'tensor'},\n    ],\n    'attrs': [{\n    'tfName': 'T',\n    'name': 'dtype',\n    'type': 'dtype',\n    'notSupported': true\n
}]\n  }\n ];\n",\n"import {OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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*\n\nexport const json: OpMapper[] = [\n  {\n    'tfOpName': 'TopKV2',\n    'category': 'evaluation',\n    'inputs': [\n
    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'k', 'type': 'number'},\n    ],\n    'attrs': [{'tfName':

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'sorted', 'name': 'sorted', 'type': 'bool']\n },\n {\n 'tfOpName': 'Unique',\n 'category': 'evaluation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n },\n {\n 'tfOpName': 'UniqueV2',\n 'category': 'evaluation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'},\n ],\n },\n ];\n", "import {OpMapper} from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'PlaceholderWithDefault',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'default', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'shape', 'name': 'shape', 'type': 'shape'},\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'}\n ]\n },\n {\n 'tfOpName': 'Placeholder',\n 'category': 'graph',\n 'attrs': [\n {'tfName': 'shape', 'name': 'shape', 'type': 'shape'},\n {'tfName': 'dtype', 'name': 'dtype', 'type': 'dtype'}\n ]\n },\n {\n 'tfOpName': 'Const', 'category': 'graph'},\n {\n 'tfOpName': 'Identity',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'IdentityN',\n 'category': 'graph',\n 'inputs': [{start: 0, 'end': 0, 'name': 'x', 'type': 'tensors'}]\n },\n {\n 'tfOpName': 'Snapshot',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'Rank',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'Size',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'Shape',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'ShapeN',\n 'category': 'graph',\n 'inputs': [{start: 0, 'end': 0, 'name': 'x', 'type': 'tensors'}]\n },\n {\n 'tfOpName': 'Print',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'data', 'type': 'tensors'},\n ],\n 'attrs': [\n {'tfName': 'message', 'name': 'message', 'type': 'string'},\n {'tfName': 'first_n', 'name': 'firstN', 'type': 'number', 'notSupported': true},\n {'tfName': 'summarize', 'name': 'summarize', 'type': 'number', 'defaultValue': 3}\n ]\n },\n {\n 'tfOpName': 'NoOp',\n 'category': 'graph',\n 'inputs': []\n },\n {\n 'tfOpName': 'StopGradient',\n 'category': 'graph',\n 'inputs': [{start: 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'FakeQuantWithMinMaxVars',\n 'category': 'graph',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'min', 'name': 'min', 'type': 'number'},\n {'tfName': 'max', 'name': 'max', 'type': 'number'}\n ]\n };\n\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'HashTable',\n 'category': 'hash_table',\n 'inputs': [],\n 'attrs': [\n {'tfName': 'shared_name', 'name': 'sharedName', 'type': 'string'},\n {\n 'tfName': 'use_node_name_sharing',\n 'name': 'useNodeNameSharing',\n 'type': 'bool'\n },\n {\n 'tfName': 'key_dtype',\n 'name': 'keyDType',\n 'type': 'dtype'},\n {\n 'tfName': 'value_dtype',\n 'name': 'valueDType',\n 'type': 'dtype'}\n ]\n },\n {\n 'tfOpName': 'HashTableV2',\n 'category': 'hash_table',\n 'inputs': [],\n 'attrs': [\n {'tfName': 'shared_name', 'name': 'sharedName', 'type': 'string'},\n {\n 'tfName': 'use_node_name_sharing',\n 'name': 'useNodeNameSharing',\n 'type': 'bool'\n },\n {\n 'tfName': 'key_dtype',\n 'name': 'keyDType',\n 'type': 'dtype'},\n {\n 'tfName': 'value_dtype',\n 'name': 'valueDType',\n 'type': 'dtype'}\n ]\n },\n {\n 'tfOpName': 'LookupTableImport',\n 'category': 'hash_table',\n 'inputs': [\n {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n {'start': 1, 'name': 'keys', 'type': 'tensor'},\n {'start': 2, 'name': 'values',
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'type': 'tensor')\n ],\n 'attrs': [\n  {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype', 'notSupported': true}, {\n  'tfName': 'Tout',\n  'name': 'tOut',\n  'type': 'dtype',\n  'notSupported': true\n  }\n ],\n {\n  'tfOpName': 'LookupTableImportV2',\n  'category': 'hash_table',\n  'inputs': [\n    {'start': 0, 'name': 'tableHandle',\n    'type': 'tensor'},\n    {'start': 1, 'name': 'keys', 'type': 'tensor'},\n    {'start': 2, 'name': 'values', 'type': 'tensor'}\n  ],\n  'attrs': [\n    {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype', 'notSupported': true}, {\n    'tfName': 'Tout',\n    'name':\n    'tOut',\n    'type': 'dtype',\n    'notSupported': true\n    }\n  ],\n  {\n    'tfOpName': 'LookupTableFind',\n    'category': 'hash_table',\n    'inputs': [\n      {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n      {'start': 1, 'name':\n      'keys', 'type': 'tensor'},\n      {'start': 2, 'name': 'defaultValue', 'type': 'tensor'}\n    ],\n    'attrs': [\n      {'tfName': 'Tin',\n      'name': 'tIn', 'type': 'dtype', 'notSupported': true}, {\n      'tfName': 'Tout',\n      'name': 'tOut',\n      'type': 'dtype',\n      'notSupported': true\n      }\n    ],\n    {\n      'tfOpName': 'LookupTableFindV2',\n      'category': 'hash_table',\n      'inputs': [\n        {'start': 0, 'name': 'tableHandle', 'type': 'tensor'},\n        {'start': 1, 'name': 'keys', 'type': 'tensor'},\n        {'start': 2, 'name': 'defaultValue', 'type': 'tensor'}\n      ],\n      'attrs': [\n        {'tfName': 'Tin', 'name': 'tIn', 'type': 'dtype',\n        'notSupported': true}, {\n        'tfName': 'Tout',\n        'name': 'tOut',\n        'type': 'dtype',\n        'notSupported': true\n        }\n      ]\n    }\n  ]\n ];\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All\n Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nexport const json: OpMapper[] = [\n  {\n    'tfOpName': 'ResizeBilinear',\n    'category': 'image',\n    'inputs': [\n      {'start': 0, 'name': 'images', 'type': 'tensor'},\n      {'start': 1, 'name': 'size', 'type': 'number[]'},\n    ],\n    'attrs': [\n      {'tfName': 'align_corners', 'name': 'alignCorners', 'type': 'bool'}, {\n      'tfName': 'half_pixel_centers',\n      'name':\n      'halfPixelCenters',\n      'type': 'bool'\n      },\n      {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n      true\n      }\n    ],\n    {\n      'tfOpName': 'ResizeNearestNeighbor',\n      'category': 'image',\n      'inputs': [\n        {'start': 0, 'name': 'images', 'type': 'tensor'},\n        {'start': 1, 'name': 'size', 'type': 'number[]'},\n      ],\n      'attrs': [\n        {'tfName': 'align_corners', 'name': 'alignCorners', 'type': 'bool'}, {\n        'tfName': 'half_pixel_centers',\n        'name':\n        'halfPixelCenters',\n        'type': 'bool'\n        },\n        {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported':\n        true\n        }\n      ],\n      {\n        'tfOpName': 'CropAndResize',\n        'category': 'image',\n        'inputs': [\n          {'start': 0, 'name': 'image', 'type': 'tensor'},\n          {'start': 1, 'name': 'boxes', 'type': 'tensor'},\n          {'start': 2, 'name': 'boxInd', 'type':\n          'tensor'},\n          {'start': 3, 'name': 'cropSize', 'type': 'number[]'},\n        ],\n        'attrs': [\n          {'tfName': 'method', 'name': 'method', 'type': 'string'}, {\n          'tfName': 'extrapolation_value',\n          'name': 'extrapolationValue',\n          'type':\n          'number'\n          }\n        ],\n      }\n    ]\n ];\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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=====\n\n*/\n\nexport const json: OpMapper[] = [\n  {\n    'tfOpName': 'Equal',\n    'category': 'logical',\n    'inputs': [\n      {'start': 0, 'name': 'a', 'type': 'tensor'},\n      {'start': 1, 'name': 'b', 'type': 'tensor'},\n    ],\n    'attrs': [\n      {'tfName': 'T',\n      'name': 'dtype', 'type': 'dtype', 'notSupported': true\n      }\n    ],\n    {\n      'tfOpName': 'NotEqual',\n      'category':\n      'logical',\n      'inputs': [\n        {'start': 0, 'name': 'a', 'type': 'tensor'},\n        {'start': 1, 'name': 'b', 'type': 'tensor'},\n      ],\n      'attrs': [\n        {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n        }\n      ],\n      {\n        'tfOpName': 'Greater',\n        'category': 'logical',\n        'inputs': [\n          {'start': 0, 'name': 'a', 'type': 'tensor'},\n          {'start': 1, 'name': 'b',\n          'type': 'tensor'},\n        ],\n        'attrs': [\n          {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true\n          }\n        ],\n      }\n    ]\n ],\n ]\n ];\n", "import { OpMapper } from '../types';\n\n/**\n * @license\n * Copyright 2018\n Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *  
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *
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{\n 'tfOpName': 'GreaterEqual',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype',\n 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'Less',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'LessEqual',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'LogicalAnd',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'LogicalNot',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'LogicalOr',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'Select',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'condition', 'type': 'tensor'},\n {'start': 1, 'name': 'a', 'type': 'tensor'},\n {'start': 2, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'SelectV2',\n 'category': 'logical',\n 'inputs': [\n {'start': 0, 'name': 'condition', 'type': 'tensor'},\n {'start': 1, 'name': 'a', 'type': 'tensor'},\n {'start': 2, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [{\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }]\n }];\n\n",/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*\n\nimport {OpMapper} from './types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': '_FusedMatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n {'start': 2, 'end': 0, 'name': 'args', 'type': 'tensors'},\n ],\n 'attrs': [\n {'tfName': 'num_args', 'name': 'numArgs', 'type': 'number'},\n {'tfName': 'fused_ops', 'name': 'fusedOps', 'type': 'string[]', 'defaultValue': []},\n {'tfName': 'epsilon', 'name': 'epsilon', 'type': 'number', 'defaultValue': 0.0001},\n {'tfName': 'transpose_a', 'name': 'transposeA', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'transpose_b', 'name': 'transposeB', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'MatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'transpose_a', 'name': 'transposeA', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'transpose_b', 'name': 'transposeB', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'BatchMatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'adj_x', 'name': 'transposeA', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'adj_y', 'name': 'transposeB', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'BatchMatMulV2',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'adj_x', 'name': 'transposeA', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'adj_y', 'name': 'transposeB', 'type': 'bool', 'defaultValue': false},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n ]\n },\n {\n 'tfOpName': 'Transpose',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ]\n }

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{'start': 1, 'name': 'perm', 'type': 'number[]',\n ],\n 'attrs': [{\n 'tfName': 'T',\n 'name': 'dtype',\n 'type': 'dtype',\n 'notSupported': true\n }]\n };\n",\n"import {OpMapper} from './types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'FusedBatchNorm',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n ]\n },\n {\n 'tfOpName': 'FusedBatchNormV2',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n ]\n },\n {\n 'tfOpName': 'FusedBatchNormV3',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n ]\n },\n {\n 'tfOpName': 'LRN',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'depth_radius',\n 'name': 'radius',\n 'type': 'number',\n 'defaultValue': 5\n },\n {\n 'tfName': 'bias',\n 'name': 'bias',\n 'type': 'number',\n 'defaultValue': 1.0\n },\n {\n 'tfName': 'alpha',\n 'name': 'alpha',\n 'type': 'number',\n 'defaultValue': 1.0\n },\n {\n 'tfName': 'beta',\n 'name': 'beta',\n 'type': 'number',\n 'defaultValue': 0.5\n }\n ]\n },\n {\n 'tfOpName': 'Softmax',\n 'category': 'normalization',\n 'inputs': [{\n 'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'LogSoftmax',\n 'category': 'normalization',\n 'inputs': [{\n 'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name': 'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name': 'defaultValue', 'type': 'tensor'},\n ],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': true,\n 'notSupported': true\n }]\n }]\n };\n",\n"import {OpMapper} from './types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an\n * "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for\n * the specific language governing permissions and\n * limitations under the License.\n *
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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Bincount',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number'},\n {'start': 2, 'name': 'weights', 'type': 'tensor'}\n ]\n },\n {\n 'tfOpName': 'DenseBincount',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'size', 'type': 'number'},\n {'start': 2, 'name': 'weights', 'type': 'tensor'}\n ],\n 'attrs': [\n {'tfName': 'binary_output', 'name': 'binaryOutput', 'type': 'bool'}\n ]\n },\n {\n
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'tfOpName': 'Max',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Mean',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Min',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Sum',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'All',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Any',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'ArgMax',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'ArgMin',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'Prod',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [{ 'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Cumsum',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n ],\n 'attrs': [\n {'tfName': 'exclusive', 'name': 'exclusive', 'type': 'bool'},\n {'tfName': 'reverse', 'name': 'reverse', 'type': 'bool'}\n ]\n }\n ];\n\n", "import {OpMapper} from '../types';\n\n**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'ConcatV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'end': -1, 'name': 'tensors', 'type': 'tensors'},\n {'start': -1, 'name': 'axis', 'type': 'number'}\n ],\n 'attrs': [\n {'tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}\n ]\n },\n {\n 'tfOpName': 'Concat',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 1, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n {'start': 0, 'name': 'axis', 'type': 'number'}\n ],\n 'attrs': [{ 'tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}]\n },\n {\n 'tfOpName': 'GatherV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n ],\n 'attrs': [{\n 'tfName': 'batch_dims',\n 'name': 'batchDims',\n 'type': 'number',\n 'defaultValue': 0\n }]\n },\n {\n 'tfOpName': 'Gather',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'},\n ],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'notSupported': true\n }]\n },\n {\n 'tfOpName': 'Reverse',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'dims', 'type': 'bool[]'}\n ]\n },\n {\n 'tfOpName': 'ReverseV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'Slice',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type': 'number[]'},\n {'start': 2, 'name': 'size', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'StridedSlice',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type': 'number[]'},\n {'start': 2, 'name': 'end', 'type': 'number[]'},\n {'start': 3, 'name': 'strides', 'type': 'number[]'}\n ],\n 'attrs': [\n {\n 'tfName': 'begin_mask',\n 'name': 'beginMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'end_mask',\n 'name': 'endMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'strides_mask',\n 'name': 'stridesMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'ellipsis_mask',\n 'name': 'ellipsisMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'new_axis_mask',\n 'name': 'newAxisMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'shrink_axis_mask',\n 'name': 'shrinkAxisMask',\n 'type': 'number',\n 'defaultValue': 0\n }\n ]\n }\n ];

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'defaultValue': 0\n  },\n  {\n    'tfName': 'new_axis_mask',\n    'name': 'newAxisMask',\n    'type': 'number',\n    'defaultValue': 0\n  },\n  {\n    'tfName': 'ellipsis_mask',\n    'name': 'ellipsisMask',\n    'type': 'number',\n    'defaultValue': 0\n  },\n  {\n    'tfName': 'shrink_axis_mask',\n    'name': 'shrinkAxisMask',\n    'type': 'number',\n    'defaultValue': 0\n  }\n ]\n },\n {\n 'tfOpName': 'Pack',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n ],\n 'attrs': [\n {'tfName': 'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n ]\n },\n {\n 'tfOpName': 'Unpack',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n ],\n 'attrs': [\n {'tfName': 'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0},\n {\n 'tfName': 'num',\n 'name': 'num',\n 'type': 'number',\n 'defaultValue': 0,\n 'notSupported': true\n }\n ]\n },\n {\n 'tfOpName': 'Tile',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'reps', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'Split',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'axis', 'type': 'number', 'defaultValue': 0},\n {'start': 1, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'num_split',\n 'name': 'numOrSizeSplits',\n 'type': 'number',\n 'defaultValue': 1\n }\n ]\n },\n {\n 'tfOpName': 'SplitV',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'numOrSizeSplits', 'type': 'number[]'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n ]\n },\n {\n 'tfOpName': 'ScatterNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'indices', 'type': 'tensor'},\n {'start': 1, 'name': 'values', 'type': 'tensor'},\n {'start': 2, 'name': 'shape', 'type': 'number[]'}\n ]\n },\n {\n 'tfOpName': 'GatherNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'}\n ]\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name': 'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name': 'defaultValue', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': false,\n 'notSupported': true\n }\n ]\n }]\n };\n\n", "import {OpMapper} from\n './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or\n implied.\n * See the License for the specific language governing permissions and\n * limitations under the\n License.\n *

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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'FFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0,\n 'name': 'x',\n 'type': 'tensor'}\n ]\n },\n {\n 'tfOpName': 'IFFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'}\n ]\n },\n {\n 'tfOpName': 'RFFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {\n 'start': 1,\n 'name': 'fft_length',\n 'type': 'number',\n 'notSupported': true\n }\n ]\n },\n {\n 'tfOpName': 'IRFFT',\n 'category': 'spectral',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {\n 'start': 1,\n 'name': 'fft_length',\n 'type': 'number',\n 'notSupported': true\n }\n ]\n }\n ]\n ];\n\n", "import {OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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=====\n\n*\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Cast',\n 'category': 'transformation',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n ],\n 'attrs': [\n {\n 'tfName': 'SrcT',\n 'name': 'sdtype',\n 'type': 'dtype',\n 'notSupported': true\n },\n {\n 'tfName': 'DstT',\n 'name': 'dtype',\n 'type': 'dtype'\n }\n ]\n },\n ]\n ];\n\n", "import {OpMapper} from './types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file\n except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,\n software\n * distributed under the License is distributed\n on an "AS IS" BASIS,\n * WITHOUT WARRANTIES\n OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *

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{\n  'tfOpName': 'ExpandDims',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'axis', 'type': 'number'}\n  ]\n },\n {\n  'tfOpName': 'MirrorPad',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'padding', 'type': 'number[]'},\n    ],\n  'attrs': [{\n    'tfName': 'mode', 'name': 'mode', 'type': 'string'}\n ]\n },\n {\n  'tfOpName': 'Pad',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'padding', 'type': 'number[]'},\n    ],\n  'attrs': [{\n    'tfName': 'constant_value',\n    'name': 'constantValue',\n    'type': 'number',\n    'defaultValue': 0\n  }]\n },\n {\n  'tfOpName': 'PadV2',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'padding', 'type': 'number[]'},\n    {\n      'start': 2,\n      'name': 'constantValue',\n      'type': 'number',\n      'defaultValue': 0\n    }\n  ]\n },\n {\n  'tfOpName': 'Reshape',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'shape', 'type': 'number[]'}\n  ]\n },\n {\n  'tfOpName': 'Squeeze',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    ],\n  'attrs': [{\n    'tfName': 'axis',\n    'tfDeprecatedName': 'squeeze_dims',\n    'name': 'axis',\n    'type': 'number[]'\n }]\n },\n {\n  'tfOpName': 'SpaceToBatchND',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n    {'start': 2, 'name': 'padding', 'type': 'number[]'}\n  ]\n },\n {\n  'tfOpName': 'BatchToSpaceND',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n    {'start': 2, 'name': 'crops', 'type': 'number[]'}\n  ]\n },\n {\n  'tfOpName': 'DepthToSpace',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    ],\n  'attrs': [\n    {'tfName': 'block_size', 'name': 'blockSize', 'type': 'number'},\n    {'tfName': 'data_format', 'name': 'dataFormat', 'type': 'string'}\n  ]\n },\n {\n  'tfOpName': 'BroadcastTo',\n  'category': 'transformation',\n  'inputs': [\n    {'start': 0, 'name': 'x', 'type': 'tensor'},\n    {'start': 1, 'name': 'shape', 'type': 'number[]'},\n    ],\n  'attrs': []\n }\n ]\n },\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*\n\nimport {DataType, env} from '@tensorflow/tfjs-core';\nimport * as tensorflow from './data/compiled_api';\nimport {getRegisteredOp} from './custom_op/register';\nimport {getNodeNameAndIndex} from './executors/utils';\nimport * as arithmetic from './op_list/arithmetic';\nimport * as basicMath from './op_list/basic_math';\nimport * as control from './op_list/control';\nimport * as convolution from './op_list/convolution';\nimport * as creation from './op_list/creation';\nimport * as dynamic from './op_list/dynamic';\nimport * as evaluation from './op_list/evaluation';\nimport * as graph from './op_list/graph';\nimport * as hashTable from './op_list/hash_table';\nimport * as image from './op_list/image';\nimport * as logical from './op_list/logical';\nimport * as matrices from './op_list/matrices';\nimport * as normalization from './op_list/normalization';\nimport * as reduction from './op_list/reduction';\nimport * as sliceJoin from './op_list/slice_join';\nimport * as spectral from './op_list/spectral';\nimport * as transformation from './op_list/transformation';\nimport {Graph, InputParamValue, Node, OpMapper, ParamValue} from './types';\n\nexport class OperationMapper {\n  private static _instance: OperationMapper;\n  private opMappers: {[key: string]: OpMapper};\n  // Singleton instance for the mapper\n  public static get Instance() {\n    return this._instance || (this._instance = new this());\n  }\n  // Loads the op mapping from the JSON file\n  private constructor() {\n    const ops = [\n      arithmetic, basicMath, control, convolution, creation, dynamic,\n      evaluation, logical, image, graph, matrices, normalization, reduction,\n      sliceJoin, spectral, transformation, hashTable\n    ];\n    const mappersJson: OpMapper[] = [].concat(...ops.map(op => op.json));\n    this.opMappers = mappersJson.reduce< {[key: string]: OpMapper}>(\n      (map, mapper: OpMapper) => {\n        map[mapper.tfOpName] = mapper;\n        return map;\n      },\n      {}\n    );\n  }\n  // Converts the model inference
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graph from Tensorflow GraphDef to local\n // representation for TensorFlow.js API\n transformGraph(\n  graph:\n  tensorflow.IGraphDef,\n  signature: tensorflow.ISignatureDef = {}): Graph {\n  const tfNodes = graph.node;\n  const placeholders: Node[] = [];\n  const weights: Node[] = [];\n  const initNodes: Node[] = [];\n  const nodes =\n  tfNodes.reduce<{{key: string}: Node}>((map, node) => {\n    map[node.name] = this.mapNode(node);\n    if\n    (node.op.startsWith('Placeholder')) {\n      placeholders.push(map[node.name]);\n    } else if (node.op === 'Const')\n    {\n      weights.push(map[node.name]);\n    } else if (node.input == null || node.input.length === 0) {\n      initNodes.push(map[node.name]);\n    }\n    return map;\n  }, {});\n  let inputs: Node[] = [];\n  const outputs:\n  Node[] = [];\n  let inputNodeNameToKey: {[key: string]: string} = {};\n  let outputNodeNameToKey: {[key:\n  string]: string} = {};\n  if (signature != null) {\n    inputNodeNameToKey =\n    this.mapSignatureEntries(signature.inputs);\n    outputNodeNameToKey =\n    this.mapSignatureEntries(signature.outputs);\n  }\n  const allNodes = Object.keys(nodes);\n  allNodes.forEach(key => {\n    const node = nodes[key];\n    node.inputNames.forEach(name => {\n      const\n      [nodeName, ] = getNodeNameAndIndex(name);\n      node.inputs.push(nodes[nodeName]);\n      nodes[nodeName].children.push(node);\n    });\n  });\n  // if signature has not outputs set, add any node that\n  does not have\n  // outputs.\n  if (Object.keys(outputNodeNameToKey).length === 0) {\n    allNodes.forEach(key => {\n      const node = nodes[key];\n      if (node.children.length === 0) {\n        outputs.push(node);\n      }\n    });\n  } else {\n    Object.keys(outputNodeNameToKey).forEach(name => {\n      const [nodeName, ] = getNodeNameAndIndex(name);\n      const node = nodes[nodeName];\n      if (node !=\n      null) {\n        node.signatureKey = outputNodeNameToKey[name];\n        outputs.push(node);\n      }\n    });\n  }\n  if (Object.keys(inputNodeNameToKey).length > 0) {\n    Object.keys(inputNodeNameToKey).forEach(name => {\n      const [nodeName, ] =\n      getNodeNameAndIndex(name);\n      const node = nodes[nodeName];\n      if (node) {\n        node.signatureKey\n        = inputNodeNameToKey[name];\n        inputs.push(node);\n      }\n    });\n  } else {\n    inputs =\n    placeholders;\n  }\n  let functions = {};\n  if (graph.library != null && graph.library.function != null) {\n    functions = graph.library.function.reduce((functions, func) => {\n      functions[func.signature.name] =\n      this.mapFunction(func);\n      return functions;\n    }, {} as {[key: string]: Graph});\n  }\n  const result: Graph\n  =\n  {\n    nodes, inputs, outputs, weights, placeholders, signature, functions;\n  }\n  if (initNodes.length > 0) {\n    result.initNodes = initNodes;\n  }\n  return result;\n}\n\nprivate mapSignatureEntries(entries: {[k: string]:\n  tensorflow.ITensorInfo}) {\n  return Object.keys(entries || {})\n    .reduce<{{key: string}: string}>((prev, curr)\n    => {\n      prev[entries[curr].name] = curr;\n      return prev;\n    }, {});\n}\n\nprivate mapNode(node:\n  tensorflow.INodeDef): Node {\n  // Unsupported ops will cause an error at run-time (not parse time), since\n  //\n  // they may not be used by the actual execution subgraph.\n  const mapper =\n  getRegisteredOp(node.op) ||\n  this.opMappers[node.op] || {} as OpMapper;\n  if (node.attr == null) {\n    node.attr = {};\n  }\n  const\n  newNode: Node = {\n    name: node.name,\n    op: node.op,\n    category: mapper.category,\n    inputNames:\n    (node.input ||\n    []).map(input => input.startsWith('^') ? input.substr(1) : input),\n    inputs: [],\n    children: [],\n    inputParams: {},\n    attrParams: {},\n    rawAttrs: node.attr\n  };\n  if (mapper.inputs !=\n  null) {\n    newNode.inputParams =\n    mapper.inputs.reduce<{{key: string}: InputParamValue}>(\n    (map, param) => {\n      map[param.name] = {\n        type: param.type,\n        inputIndexStart:\n        param.start,\n        inputIndexEnd: param.end\n      };\n      return map;\n    },\n    {});\n  }\n  if (mapper.attrs != null) {\n    newNode.attrParams =\n    mapper.attrs.reduce<{{key: string]:\n    ParamValue}>((map, param) => {\n      const type = param.type;\n      let value = undefined;\n      switch\n      (param.type) {\n        case 'string':\n          value = getStringParam(\n            node.attr, param.tfName,\n            param.defaultValue as string);\n          if (value === undefined && !param.tfDeprecatedName) {\n            value = getStringParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as\n              string);\n          }\n          break;\n        case 'string[]':\n          value = getStringArrayParam(\n            node.attr, param.tfName, param.defaultValue as string[]);\n          if (value === undefined &&\n          !param.tfDeprecatedName) {\n            value = getStringArrayParam(\n              node.attr,\n              param.tfDeprecatedName,\n              param.defaultValue as string[]);\n          }\n          break;\n      }\n    });\n  }\n}

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case 'number':\n          value = getNumberParam(\n          node.attr, param.tfName,\n          (param.defaultValue || 0) as number);\n          if (value === undefined && !!param.tfDeprecatedName) {\n            value = getNumberParam(\n            node.attr, param.tfDeprecatedName,\n            param.defaultValue as number);\n          }\n          break;\n          case 'number[]':\n            value =\n            getNumericArrayParam(\n            node.attr, param.tfName, param.defaultValue as number[]);\n            if\n            (value === undefined && !!param.tfDeprecatedName) {\n              value = getNumericArrayParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as number[]);\n            }\n            break;\n          case 'bool':\n            value = getBoolParam(\n            node.attr, param.tfName,\n            param.defaultValue as boolean);\n            if (value === undefined && !!param.tfDeprecatedName) {\n              value = getBoolParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as\n              boolean);\n            }\n            break;\n          case 'bool[]':\n            value = getBoolArrayParam(\n            node.attr, param.tfName, param.defaultValue as boolean[]);\n            if (value === undefined &&\n            !!param.tfDeprecatedName) {\n              value = getBoolArrayParam(\n              node.attr,\n              param.tfDeprecatedName,\n              param.defaultValue as boolean[]);\n            }\n            break;\n          case 'shape':\n            value = getTensorShapeParam(\n            node.attr, param.tfName, param.defaultValue\n            as number[]);\n            if (value === undefined && !!param.tfDeprecatedName) {\n              value =\n              getTensorShapeParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as\n              number[]);\n            }\n            break;\n          case 'shape[]':\n            value =\n            getTensorShapeArrayParam(\n            node.attr, param.tfName, param.defaultValue as number[][]);\n            if (value === undefined && !!param.tfDeprecatedName) {\n              value = getTensorShapeArrayParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as number[][]);\n            }\n            break;\n          case 'dtype':\n            value = getDtypeParam(\n            node.attr, param.tfName,\n            param.defaultValue as DataType);\n            if (value === undefined && !!param.tfDeprecatedName) {\n              value = getDtypeParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as\n              DataType);\n            }\n            break;\n          case 'dtype[]':\n            value = getDtypeArrayParam(\n            node.attr, param.tfName, param.defaultValue as DataType[]);\n            if (value === undefined &&\n            !!param.tfDeprecatedName) {\n              value = getDtypeArrayParam(\n              node.attr,\n              param.tfDeprecatedName,\n              param.defaultValue as DataType[]);\n            }\n            break;\n          case 'func':\n            value = getFuncParam(\n            node.attr, param.tfName, param.defaultValue as\n            string);\n            if (value === undefined && !!param.tfDeprecatedName) {\n              value = getFuncParam(\n              node.attr, param.tfDeprecatedName,\n              param.defaultValue as string);\n            }\n            break;\n          case 'tensor':\n          case 'tensors':\n            break;\n          default:\n            throw new\n            Error(\n            `Unsupported param type: ${param.type} for op: ${node.op}`);\n          }\n          map[param.name] = {value, type};\n          return map;\n        }, {});\n      }\n      return newNode;\n    }\n  }\n  // map\n  the TFunctionDef to TFJS graph object\n  private mapFunction(functionDef: tensorflow.IFunctionDef): Graph {\n    const tfNodes = functionDef.nodeDef;\n    const placeholders: Node[] = [];\n    const weights: Node[] = [];\n    let\n    nodes: {[key: string]: Node} = {};\n    if (tfNodes != null) {\n      nodes = tfNodes.reduce<{[key: string]:\n      Node}>((map, node) => {\n        map[node.name] = this.mapNode(node);\n        if (node.op === 'Const') {\n          weights.push(map[node.name]);\n        }\n        return map;\n      }, {});\n    }\n    const inputs: Node[] = [];\n    const\n    outputs: Node[] = [];\n    functionDef.signature.inputArg.forEach(arg => {\n      const [nodeName, ] =\n      getNodeNameAndIndex(arg.name);\n      const node: Node = {\n        name: nodeName,\n        op: 'Placeholder',\n        inputs: [],\n        inputNames: [],\n        category: 'graph',\n        inputParams: {},\n        attrParams: {dtype: {value:\n        parseDtypeParam(arg.type), type: 'dtype'}},\n        children: []\n      };\n      node.signatureKey = arg.name;\n      inputs.push(node);\n      nodes[nodeName] = node;\n    });\n    const allNodes = Object.keys(nodes);\n    allNodes.forEach(key => {\n      const node = nodes[key];\n      node.inputNames.forEach(name => {\n        const\n        [nodeName, ] = getNodeNameAndIndex(name);\n        node.inputs.push(nodes[nodeName]);\n        nodes[nodeName].children.push(node);\n      });\n    });\n    const returnNodeMap = functionDef.ret;\n    functionDef.signature.outputArg.forEach(output => {\n      const [nodeName, index] =

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getNodeNameAndIndex(returnNodeMap[output.name]);\n    const node = nodes[nodeName];\n    if (node != null)
{\n    node.defaultOutput = index;\n    outputs.push(node);\n    }\n    });\n\n    const signature =
this.mapArgsToSignature(functionDef);\n    return {nodes, inputs, outputs, weights, placeholders, signature};\n
}\n\n    private mapArgsToSignature(functionDef: tensorflow.IFunctionDef):\n    tensorflow.ISignatureDef {\n
return {\n    methodName: functionDef.signature.name,\n    inputs: functionDef.signature.inputArg.reduce(\n
(map, arg) => {\n    map[arg.name] = this.mapArgToTensorInfo(arg);\n    return map;\n    },\n    {}
) as {[key: string]: tensorflow.ITensorInfo}),\n    outputs: functionDef.signature.outputArg.reduce(\n
(map, arg) => {\n    map[arg.name] = this.mapArgToTensorInfo(arg, functionDef.ret);\n    return map;\n
},\n    {}
) as {[key: string]: tensorflow.ITensorInfo}),\n    };
}\n\n    private mapArgToTensorInfo(\n    arg:
tensorflow.OpDef.IArgDef,\n    nameMap?: {[key: string]: string}): tensorflow.ITensorInfo {\n    let name =
arg.name;\n    if (nameMap != null) {\n    name = nameMap[name];\n    }\n    return {name, dtype: arg.type};\n
}\n}\n\nexport function decodeBase64(text: string): string {\n    const global = env().global;\n    if (typeof global.atob
!=='undefined') {\n    return global.atob(text);\n    } else if (typeof Buffer !== 'undefined') {\n    return new
Buffer(text, 'base64').toString();\n    } else {\n    throw new Error(\n    'Unable to decode base64 in this
environment. ' +\n    'Missing built-in atob() or Buffer()');\n    }\n}\n\nexport function paramString(s: []|string,
keepCase: boolean): string {\n    const value =\n    Array.isArray(s) ? String.fromCharCode.apply(null, s) :
decodeBase64(s);\n    return keepCase ? value : value.toLowerCase();\n}\n\nexport function getStringParam(\n
attrs: {[key: string]: tensorflow.IAttrValue}, name: string, def: string,\n    keepCase = false): string {\n    const param
= attrs[name];\n    if (param != null) {\n    return paramString(param.s, keepCase);\n    }\n    return
def;\n}\n\nexport function getBoolParam(\n    attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n    def:
boolean): boolean {\n    const param = attrs[name];\n    return param ? param.b : def;\n}\n\nexport function
getNumberParam(\n    attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n    def: number): number {\n
const param = attrs[name] || {};\n    const value =\n    param['i'] != null ? param['i'] : (param['f'] != null ? param['f'] :
def);\n    return (typeof value === 'number') ? value : parseInt(value, 10);\n}\n\nexport function
parseDtypeParam(value: string|tensorflow.DataType): DataType {\n    if (typeof (value) === 'string') {\n    //
tslint:disable-next-line:no-any\n    value = tensorflow.DataType[value as any];\n    }\n    switch (value) {\n    case
tensorflow.DataType.DT_FLOAT:\n    return 'float32';\n    case tensorflow.DataType.DT_INT32:\n    case
tensorflow.DataType.DT_INT64:\n    case tensorflow.DataType.DT_INT8:\n    case
tensorflow.DataType.DT_UINT8:\n    return 'int32';\n    case tensorflow.DataType.DT_BOOL:\n    return 'bool';\n
case tensorflow.DataType.DT_DOUBLE:\n    return 'float32';\n    case tensorflow.DataType.DT_STRING:\n
return 'string';\n    default:\n    // Unknown dtype error will happen at runtime (instead of parse time),\n    // since
these nodes might not be used by the actual subgraph execution.\n    return null;\n    }\n}\n\nexport function
getFuncParam(\n    attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n    def: string): string {\n    const
param = attrs[name];\n    if (param && param.func) {\n    return param.func.name;\n    }\n    return def;\n}\n\nexport
function getDtypeParam(\n    attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n    def: DataType):
DataType {\n    const param = attrs[name];\n    if (param && param.type) {\n    return
parseDtypeParam(param.type);\n    }\n    return def;\n}\n\nexport function getDtypeArrayParam(\n    attrs: {[key:
string]: tensorflow.IAttrValue}, name: string,\n    def: DataType[]): DataType[] {\n    const param = attrs[name];\n
if (param && param.list && param.list.type) {\n    return param.list.type.map(v => parseDtypeParam(v));\n    }\n
return def;\n}\n\nexport function parseTensorShapeParam(shape: tensorflow.ITensorShape): number[]|\n
undefined {\n    if (shape.unknownRank) {\n    return undefined;\n    }\n    if (shape.dim != null) {\n    return
shape.dim.map(\n    dim =>\n    (typeof dim.size === 'number') ? dim.size : parseInt(dim.size, 10));\n    }\n
return [];\n}\n\nexport function getTensorShapeParam(\n    attrs: {[key: string]: tensorflow.IAttrValue}, name:
string,\n    def?: number[]): number[]|undefined {\n    const param = attrs[name];\n    if (param && param.shape) {\n
return parseTensorShapeParam(param.shape);\n    }\n    return def;\n}\n\nexport function getNumericArrayParam(\n
attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n    def: number[]): number[] {\n    const param =
attrs[name];\n    if (param) {\n    return ((param.list.f && param.list.f.length ? param.list.f :\n
param.list.i) ||\n    [])\n    .map(v => (typeof v === 'number') ? v : parseInt(v, 10));\n    }\n    return

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def;\n}\n\nexport function getStringArrayParam(\n  attrs: {[key: string]: tensorflow.IAttrValue}, name: string, def:
string[],\n  keepCase = false): string[] {\n  const param = attrs[name];\n  if (param && param.list && param.list.s)
{\n  return param.list.s.map((v) => {\n    return paramStringParam(v, keepCase);\n  });\n  }\n  return
def;\n}\n\nexport function getTensorShapeArrayParam(\n  attrs: {[key: string]: tensorflow.IAttrValue}, name:
string,\n  def: number[][]): number[][] {\n  const param = attrs[name];\n  if (param && param.list &&
param.list.shape) {\n  return param.list.shape.map((v) => {\n    return parseTensorShapeParam(v);\n  });\n  }\n  return
def;\n}\n\nexport function getBoolArrayParam(\n  attrs: {[key: string]: tensorflow.IAttrValue}, name:
string,\n  def: boolean[]): boolean[] {\n  const param = attrs[name];\n  if (param && param.list && param.list.b)
{\n  return param.list.b;\n  }\n  return def;\n}\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====
*\n\nimport {DataType, Tensor} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from
'../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {getTensor} from
'../executors/utils';\nimport {getBoolArrayParam, getBoolParam, getDtypeArrayParam, getDtypeParam,
getNumberParam, getNumericArrayParam, getStringArrayParam, getStringParam, getTensorShapeArrayParam,
getTensorShapeParam} from './operation_mapper';\nimport {GraphNode, Node, ValueType} from
'./types';\n\n/**\n * Helper class for lookup inputs and params for nodes in the model graph.\n */\nexport class
NodeValueImpl implements GraphNode {\n  public readonly inputs: Tensor[] = [];\n  public readonly attrs: {[key:
string]: ValueType} = {};\n  constructor(\n    private node: Node, private tensorMap: NamedTensorsMap,\n    private context: ExecutionContext) {\n    this.inputs = node.inputNames.map(name => this.getInput(name));\n    if
(node.rawAttrs != null) {\n    this.attrs = Object.keys(node.rawAttrs)\n      .reduce((attrs: {[key: string]:
ValueType}, key) => {\n      attrs[key] = this.getAttr(key);\n      return attrs;\n    }, {});\n    }\n  }\n  /**\n * Return the value of the attribute or input param.\n * @param name String: name of
attribute or input param.\n *\n private getInput(name: string): Tensor {\n  return getTensor(name,
this.tensorMap, this.context);\n  }\n  /**\n * Return the value of the attribute or input param.\n * @param name
String: name of attribute or input param.\n *\n private getAttr(name: string, defaultValue?: ValueType):
ValueType {\n  const value = this.node.rawAttrs[name];\n  if (value.tensor != null) {\n  return getTensor(name,
this.tensorMap, this.context);\n  }\n  if (value.i != null || value.f != null) {\n  return
getNumberParam(this.node.rawAttrs, name, defaultValue as number);\n  }\n  if (value.s != null) {\n  return
getStringParam(this.node.rawAttrs, name, defaultValue as string);\n  }\n  if (value.b != null) {\n  return
getBoolParam(this.node.rawAttrs, name, defaultValue as boolean);\n  }\n  if (value.shape != null) {\n  return
getTensorShapeParam(\n    this.node.rawAttrs, name, defaultValue as number[]);\n  }\n  if (value.type != null)
{\n  return getDtypeParam(this.node.rawAttrs, name, defaultValue as DataType);\n  }\n  if (value.list != null)
{\n  if (value.list.i != null || value.list.f != null) {\n  return getNumericArrayParam(\n
this.node.rawAttrs, name, defaultValue as number[]);\n  }\n  if (value.list.s != null) {\n  return
getStringArrayParam(\n    this.node.rawAttrs, name, defaultValue as string[]);\n  }\n  if (value.list.shape
!= null) {\n  return getTensorShapeArrayParam(\n    this.node.rawAttrs, name, defaultValue as
number[][]);\n  }\n  if (value.list.b != null) {\n  return getBoolArrayParam(\n    this.node.rawAttrs,
name, defaultValue as boolean[]);\n  }\n  if (value.list.type != null) {\n  return getDtypeArrayParam(\n
this.node.rawAttrs, name, defaultValue as DataType[]);\n  }\n  }\n  return defaultValue;\n  }\n}\n\n"/**\n *
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=====
\n\n/\n * This file exports ops used by the converters executors. By default it
* re-exports all ops. In a custom build this is aliased to a file that
* only exports ops for a given model.json.\n */\nexport * from './ops';
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*\n\n

=====
*\n\nimport {Tensor} from '@tensorflow/tfjs-core';
// tslint:disable-next-line: no-imports-from-dist
import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';
import {NamedTensorsMap} from './../data/types';
import {ExecutionContext} from './../executor/execution_context';
import {InternalOpExecutor, Node} from './types';
import {getParamValue} from './utils';
\nexport const executeOp: InternalOpExecutor =
 (node: Node, tensorMap: NamedTensorsMap,
 context: ExecutionContext): Tensor[] => {\n switch
 (node.op) {\n case 'BiasAdd':
 case 'AddV2':
 case 'Add': {\n return [tfOps.add(
 getParamValue('a', node, tensorMap, context) as Tensor),
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'AddN': {\n return [tfOps.addN(
 getParamValue('tensors', node, tensorMap, context) as Tensor[])];
 }\n case 'FloorMod':
 case 'Mod':
 return [tfOps.mod(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'Mul':
 return [tfOps.mul(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 case 'RealDiv':
 case 'Div': {\n return [tfOps.div(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'DivNoNaN': {\n return [tfOps.divNoNaN(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'FloorDiv': {\n return [tfOps.floorDiv(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'Sub': {\n return [tfOps.sub(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'Minimum': {\n return [tfOps.minimum(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'Maximum': {\n return [tfOps.maximum(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'Pow': {\n return [tfOps.pow(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n case 'SquaredDifference': {\n return [tfOps.squaredDifference(
 getParamValue('a', node, tensorMap, context) as Tensor,
 getParamValue('b', node, tensorMap, context) as Tensor)];
 }\n default:
 throw TypeError(`Node type \${node.op} is not implemented`);
 }\n};
\nexport const CATEGORY = 'arithmetic';
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*\n\n

```

*\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as
tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from
'./../data/types';\nimport {ExecutionContext} from './../executor/execution_context';\nimport {InternalOpExecutor,
Node} from './types';\nimport {getParamValue, getTensor} from './utils';\n\nexport const executeOp:
InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[]
=> {\n switch (node.op) {\n case 'Abs':\n case 'ComplexAbs':\n return [tfOps.abs(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Acos':\n return [tfOps.acos(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Acosh':\n return [tfOps.acosh(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Asin':\n return [tfOps.asin(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Asinh':\n return [tfOps.asinh(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Atan':\n return [tfOps.atan(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Atan2':\n return [tfOps.atan2(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('y', node, tensorMap, context) as
Tensor)];\n case 'Atanh':\n return [tfOps.atanh(\n getParamValue('x', node, tensorMap, context) as
Tensor)];\n case 'Ceil':\n return [tfOps.ceil(\n getParamValue('x', node, tensorMap, context) as
Tensor)];\n case 'Complex':\n return [tfOps.complex(\n getParamValue('real', node, tensorMap,
context) as Tensor,\n getParamValue('imag', node, tensorMap, context) as Tensor)];\n case 'Cos':\n
return [tfOps.cos(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Cosh':\n
return [tfOps.cosh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Elu':\n
return [tfOps.elu(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Erf':\n
return [tfOps.erf(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Exp':\n
return [tfOps.exp(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Expml': {\n
return [tfOps.expml(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case
'Floor':\n return [tfOps.floor(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case
'Log':\n return [tfOps.log(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case
'Log1p': {\n return [tfOps.log1p(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n
}\n case 'Imag':\n return [tfOps.imag(\n getParamValue('x', node, tensorMap, context) as
Tensor)];\n case 'Neg':\n return [tfOps.neg(\n getParamValue('x', node, tensorMap, context) as
Tensor)];\n case 'Reciprocal': {\n return [tfOps.reciprocal(\n getParamValue('x', node, tensorMap,
context) as Tensor)];\n }\n case 'Real':\n return [tfOps.real(\n getParamValue('x', node,
tensorMap, context) as Tensor)];\n case 'Relu':\n return [tfOps.relu(\n getParamValue('x', node,
tensorMap, context) as Tensor)];\n case 'Round': {\n return [tfOps.round(\n getParamValue('x',
node, tensorMap, context) as Tensor)];\n }\n case 'Selu':\n return [tfOps.selu(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sigmoid':\n return [tfOps.sigmoid(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sin':\n return [tfOps.sin(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sign': {\n return [tfOps.sign(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Sinh': {\n return [tfOps.sinh(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Softplus': {\n return
[tfOps.softplus(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Sqrt': {\n
return [tfOps.sqrt(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case
'Square': {\n return [tfOps.square(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n
}\n case 'Tanh': {\n return [tfOps.tanh(\n getParamValue('x', node, tensorMap, context) as
Tensor)];\n }\n case 'Tan':\n return [tfOps.tan(\n getParamValue('x', node, tensorMap,
context) as Tensor)];\n case 'ClipByValue':\n return [tfOps.clipByValue(\n getParamValue('x',
node, tensorMap, context) as Tensor,\n getParamValue('clipValueMin', node, tensorMap, context) as
number,\n getParamValue('clipValueMax', node, tensorMap, context) as number)];\n case
'Relu6':\n return [tfOps.relu6(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case
'Rsqrt':\n return [tfOps.rsqrt(\n getTensor(node.inputNames[0], tensorMap, context))];\n case

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'Prod':\n      return [tfOps.prod(\n          getParamValue('x', node, tensorMap, context) as Tensor,\n          getParamValue('axes', node, tensorMap, context) as number[])];\n      case 'LeakyRelu':\n      return\n      [tfOps.leakyRelu(\n          getParamValue('x', node, tensorMap, context) as Tensor,\n          getParamValue('alpha', node, tensorMap, context) as number)];\n      case 'Prelu':\n      return [tfOps.prelu(\n          getParamValue('x', node, tensorMap, context) as Tensor,\n          getParamValue('alpha', node, tensorMap,\n          context) as Tensor)];\n      default:\n      throw TypeError(`Node type ${node.op} is not implemented`);\n      }\n};\n\nexport const CATEGORY = 'basic_math';\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=====
*/\n**\n * This differs from util.assertShapesMatch in that it allows values of\n * negative one, an undefined size of a dimension, in a shape to match\n * anything.\n */\nimport {Tensor, util} from '@tensorflow/tfjs-core';\n\n * Used by TensorList and TensorArray to verify if elementShape matches, support\n * negative value as the dim shape.\n * @param shapeA\n * @param shapeB\n * @param errorMessagePrefix\n */\nexport function\nassertShapesMatchAllowUndefinedSize(\n  shapeA: number|number[], shapeB: number|number[],\n  errorMessagePrefix = "): void {\n  // constant shape means unknown rank\n  if (typeof shapeA === 'number' || typeof\n  shapeB === 'number') {\n    return;\n  }\n  util.assert(\n    shapeA.length === shapeB.length,\n    () =>\n    errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);\n  for (let i = 0; i < shapeA.length; i++) {\n    const dim0 = shapeA[i];\n    const dim1 = shapeB[i];\n    util.assert(\n      dim0 < 0 || dim1 < 0 || dim0 === dim1,\n      () =>\n      errorMessagePrefix + `Shapes ${shapeA} and ${shapeB} must match`);\n  }\n}\n\nexport\nfunction fullDefinedShape(elementShape: number|number[]): boolean {\n  if (typeof elementShape === 'number' ||\n  elementShape.some(dim => dim < 0)) {\n    return false;\n  }\n  return true;\n}\n\n * Generate the output element\nshape from the list elementShape, list tensors\n * and input param.\n * @param listElementShape\n * @param\n tensors\n * @param elementShape\n */\nexport function inferElementShape(\n  listElementShape:\n  number|number[], tensors: Tensor[],\n  elementShape: number|number[]): number[] {\n  let partialShape =\n  mergeElementShape(listElementShape, elementShape);\n  const notFullDefinedShape =\n  !fullDefinedShape(partialShape);\n  if (notFullDefinedShape && tensors.length === 0) {\n    throw new Error(\n    `Tried to calculate elements of an empty list` +\n    ` with non-fully-defined elementShape: ${partialShape}`);\n  }\n  if (notFullDefinedShape) {\n    tensors.forEach(tensor => {\n      partialShape =\n      mergeElementShape(tensor.shape, partialShape);\n    });\n  }\n  if (!fullDefinedShape(partialShape)) {\n    throw\n    new Error(`Non-fully-defined elementShape: ${partialShape}`);\n  }\n  return partialShape as\n  number[];\n}\n\nexport function mergeElementShape(\n  elementShapeA: number|number[], elementShapeB:\n  number|number[]): number|\n  number[] {\n  if (typeof elementShapeA === 'number') {\n    return\n    elementShapeB;\n  }\n  if (typeof elementShapeB === 'number') {\n    return elementShapeA;\n  }\n  if\n  (elementShapeA.length !== elementShapeB.length) {\n    throw new Error(`Incompatible ranks during merge:\n    ${elementShapeA} vs. ${\n    elementShapeB}`);\n  }\n  const result: number[] = [];\n  for (let i = 0; i <\n  elementShapeA.length; ++i) {\n    const dim0 = elementShapeA[i];\n    const dim1 = elementShapeB[i];\n    if (dim0\n    >= 0 && dim1 >= 0 && dim0 !== dim1) {\n      throw new Error(`Incompatible shape during merge:\n    ${elementShapeA} vs. ${\n    elementShapeB}`);\n    }\n    result[i] = dim0 >= 0 ? dim0 : dim1;\n  }\n  return\n  result;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\nApache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the\nLicense.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n * software\n * distributed under the License is distributed\non an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n\n*/\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from\n '@tensorflow/tfjs-core';\nimport {assertShapesMatchAllowUndefinedSize} from './tensor_utils';\n\nexport\n interface TensorWithState {\n   tensor?: Tensor;\n   written?: boolean;\n   read?: boolean;\n   cleared?:\n   boolean;\n}\n\n/**\n * The TensorArray object keeps an array of Tensors. It\n * allows reading from the array and\n writing to the array.\n */\n\nexport class TensorArray {\n  private tensors: TensorWithState[] = [];\n  private closed_ =\n  false;\n  readonly idTensor: Tensor;\n  constructor(\n    readonly name: string, readonly dtype: DataType, private\n    maxSize: number,\n    private elementShape: number[], readonly identicalElementShapes: boolean,\n    readonly\n    dynamicSize: boolean, readonly clearAfterRead: boolean) {\n    this.idTensor = scalar(0);\n    keep(this.idTensor);\n  }\n\n  get id() {\n    return this.idTensor.id;\n  }\n\n  get closed() {\n    return this.closed_;\n  }\n\n  /**\n   * Dispose\n the tensors and idTensor and mark the TensorArray as closed.\n */\n  clearAndClose(keepIds?: Set<number>) {\n    this.tensors.forEach(tensor => {\n      if (keepIds == null || !keepIds.has(tensor.tensor.id)) {\n        tensor.tensor.dispose();\n      }\n    });\n    this.tensors = [];\n    this.closed_ = true;\n    this.idTensor.dispose();\n  }\n\n  size(): number {\n    return this.tensors.length;\n  }\n\n  /**\n   * Read the value at location index in the\n TensorArray.\n   * @param index Number the index to read from.\n   */\n  read(index: number): Tensor {\n    if\n (this.closed_) {\n      throw new Error(`TensorArray ${this.name} has already been closed.`);\n    }\n    if (index <\n 0 || index >= this.size()) {\n      throw new Error(`Tried to read from index ${index}, but array size is: ${\n    this.size()}`);\n    }\n    const tensorWithState = this.tensors[index];\n    if (tensorWithState.cleared) {\n      throw\n new Error(`\n    TensorArray ${this.name}: Could not read index ${\n      index} twice because it was\n    cleared after a previous read` +\n      `(perhaps try setting clear_after_read = false?).`);\n    }\n    if\n (this.clearAfterRead) {\n      tensorWithState.cleared = true;\n    }\n    tensorWithState.read = true;\n    return\n tensorWithState.tensor;\n  }\n\n  /**\n   * Helper method to read multiple tensors from the specified indices.\n */\n  readMany(indices: number[]): Tensor[] {\n    return indices.map(index => this.read(index));\n  }\n\n  /**\n   * Write\n value into the index of the TensorArray.\n   * @param index number the index to write to.\n   * @param tensor\n */\n  write(index: number, tensor: Tensor) {\n    if (this.closed_) {\n      throw new Error(`TensorArray ${this.name}\n    has already been closed.`);\n    }\n    if (index < 0 || !this.dynamicSize && index >= this.maxSize) {\n      throw\n new Error(`Tried to write to index ${\n      index}, but array is not resizeable and size is: ${this.maxSize}`);\n    }\n    const t = this.tensors[index] || {};\n    if (tensor.dtype !== this.dtype) {\n      throw new Error(`TensorArray\n    ${\n      this.name}: Could not write to TensorArray index ${index},\n      because the value dtype is ${\n        tensor.dtype}, but TensorArray dtype is ${this.dtype}.`);\n    }\n    // Set the shape for the first time write to\n unknow shape tensor array\n    if (this.size() === 0 && (this.elementShape == null || this.elementShape.length\n    === 0)) {\n      this.elementShape = tensor.shape;\n    }\n    assertShapesMatchAllowUndefinedSize(\n    this.elementShape, tensor.shape,\n    `TensorArray ${this.name}: Could not write to TensorArray index ${\n    index}.`);\n    if (t.read) {\n      throw new Error(`\n    TensorArray ${this.name}: Could not write to\n    TensorArray index ${\n      index}, because it has already been read.`);\n    }\n    if (t.written) {\n      throw\n new Error(`\n    TensorArray ${this.name}: Could not write to TensorArray index ${\n      index}, because\n    it has already been written.`);\n    }\n    t.tensor = tensor;\n    keep(tensor);\n    t.written = true;\n    this.tensors[index] = t;\n  }\n\n  /**\n   * Helper method to write multiple tensors to the specified indices.\n */\n  writeMany(indices: number[], tensors: Tensor[]) {\n    if (indices.length !== tensors.length) {\n      throw new\n Error(`\n    TensorArray ${this.name}: could not write multiple tensors,`\n      +\n      `because the index size: ${\n        indices.length} is not the same as tensors size: ${\n        tensors.length}.`);\n    }\n    indices.forEach((i,\n    index) => this.write(i, tensors[index]));\n  }\n\n  /**\n   * Return selected values in the TensorArray as a packed\n Tensor. All of\n * selected values must have been written and their shapes must all match.\n   * @param [indices]\n number[] Optional. Taking values in [0, max_value). If the\n * TensorArray is not dynamic, max_value=size(). If\n not specified returns\n * all tensors in the original order.\n   * @param [dtype]\n */\n  gather(indices?: number[],\n dtype?: DataType): Tensor {\n    if (!dtype && dtype !== this.dtype) {\n      throw new Error(`TensorArray dtype is
```

```

    this.dtype} but gather requested dtype ${dtype}`);
  }
  if (!indices) {
    indices = [];
    for (let i = 0; i < this.size(); i++) {
      indices.push(i);
    }
  } else {
    indices = indices.slice(0, this.size());
  }
  if (indices.length === 0) {
    return tensor([], [0].concat(this.elementShape));
  }
  // Read all the PersistentTensors into a vector to keep track of
  // their memory.
  const tensors = this.readMany(indices);
  assertShapesMatchAllowUndefinedSize(
    this.elementShape, tensors[0].shape, "TensorArray shape mismatch:");
  return stack(tensors, 0);
}

/**
 * Return the values in the TensorArray as a concatenated Tensor.
 */
concat(dtype?: DataType): Tensor {
  if (!dtype && dtype !== this.dtype) {
    throw new Error(`TensorArray dtype is ${
      this.dtype} but concat requested dtype ${dtype}`);
  }
  if (this.size() === 0) {
    return tensor([], [0].concat(this.elementShape));
  }
  const indices = [];
  for (let i = 0; i < this.size(); i++) {
    indices.push(i);
  }
  // Collect all the tensors from the tensors array.
  const tensors = this.readMany(indices);
  assertShapesMatchAllowUndefinedSize(
    this.elementShape, tensors[0].shape, '\n`TensorArray shape mismatch: tensor array shape (${
      this.elementShape}) vs first tensor shape (${
      tensors[0].shape})`');
  return concat(tensors, 0);
}

/**
 * Scatter the values of a Tensor in specific indices of a TensorArray.
 * @param indices nummber[] values in [0, max_value). If the
 * TensorArray is not dynamic, max_value=size().
 * @param tensor Tensor input tensor.
 */
scatter(indices: number[], tensor: Tensor) {
  if (tensor.dtype !== this.dtype) {
    throw new Error(`TensorArray dtype is ${
      this.dtype} but tensor has dtype ${tensor.dtype}`);
  }
  if (indices.length !== tensor.shape[0]) {
    throw new Error(`Expected len(indices) == tensor.shape[0], but saw: ${
      indices.length} vs. ${tensor.shape[0]}`);
  }
  const maxIndex = Math.max(...indices);
  if (!this.dynamicSize && maxIndex >= this.maxSize) {
    throw new Error(`\n`Max index must be < array size (${maxIndex} vs. ${this.maxSize})`);
  }
  this.writeMany(indices, unstack(tensor, 0));
}

/**
 * Split the values of a Tensor into the TensorArray.
 * @param length number[] with the lengths to use when splitting value along
 * its first dimension.
 * @param tensor Tensor, the tensor to split.
 */
split(length: number[], tensor: Tensor) {
  if (tensor.dtype !== this.dtype) {
    throw new Error(`TensorArray dtype is ${
      this.dtype} but tensor has dtype ${tensor.dtype}`);
  }
  let totalLength = 0;
  const cumulativeLengths = length.map(len => {
    totalLength += len;
    return totalLength;
  });
  if (totalLength !== tensor.shape[0]) {
    throw new Error(`Expected sum of lengths to be equal to\n`
      tensor.shape[0], but sum of lengths is\n`
      ${totalLength}, and tensor's shape is: ${tensor.shape}`);
  }
  if (!this.dynamicSize && length.length !== this.maxSize) {
    throw new Error(`\n`TensorArray's size is not equal to the size of lengths (${
      this.maxSize} vs. ${length.length}),\n`
      and the TensorArray is not marked as dynamically resizable`);
  }
  const elementPerRow = totalLength === 0 ? 0 : tensor.size / totalLength;
  const tensors: Tensor[] = [];
  tidy(() => {
    tensor = reshape(tensor, [1, totalLength, elementPerRow]);
    for (let i = 0; i < length.length; ++i) {
      const previousLength = (i === 0) ? 0 : cumulativeLengths[i - 1];
      const indices = [0, previousLength, 0];
      const sizes = [1, length[i], elementPerRow];
      tensors[i] = reshape(slice(tensor, indices, sizes),
        this.elementShape);
    }
    return tensors;
  });
  const indices = [];
  for (let i = 0; i < length.length; i++) {
    indices[i] = i;
  }
  this.writeMany(indices, tensors);
}
}

=====\n
*/\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from
'@tensorflow/tfjs-core';
import {assertShapesMatchAllowUndefinedSize, inferElementShape,
mergeElementShape} from './tensor_utils';
/**
 * TensorList stores a container of `tf.Tensor` objects, which are
accessible
 * via tensors field.
 */
/**
 * In order to get a copy of the underlying list, use the copy method:
 */
TensorList b = a.copy();
 * b.tensors().pushBack(t); // This does not modify a.tensors().
 * Note that

```

this is not a deep copy: the memory locations of the underlying tensors will still point to the same locations of the corresponding tensors in the original.

```

export class TensorList {
  readonly idTensor: Tensor;
  maxNumElements: number;

  get id() {
    return this.idTensor.id;
  }

  /**
   * @param tensors list of tensors
   * @param elementShape shape of each tensor, this can be a single number (any shape is allowed) or partial shape (dim = -1).
   * @param elementDtype data type of each tensor
   * @param maxNumElements The maximum allowed size of `tensors`. Defaults to -1 meaning that the size of `tensors` is unbounded.
   */
  constructor(
    readonly tensors: Tensor[],
    readonly elementShape: number|number[],
    readonly elementDtype: DataType,
    maxNumElements = -1) {
    if (tensors != null) {
      tensors.forEach(tensor => {
        if (elementDtype !== tensor.dtype) {
          throw new Error(`Invalid data types; op elements ${elementDtype}, but list elements ${tensor.dtype}`);
        }
        assertShapesMatchAllowUndefinedSize(
          elementShape, tensor.shape, 'TensorList shape mismatch: ');
        keep(tensor);
      });
      this.idTensor = scalar(0);
      this.maxNumElements = maxNumElements;
      keep(this.idTensor);
    }

    /**
     * Get a new TensorList containing a copy of the underlying tensor container.
     */
    copy(): TensorList {
      return new TensorList(
        [...this.tensors], this.elementShape, this.elementDtype);
    }

    /**
     * Dispose the tensors and idTensor and clear the tensor list.
     */
    clearAndClose(keepIds?: Set<number>) {
      this.tensors.forEach(tensor => {
        if (keepIds == null || !keepIds.has(tensor.id)) {
          tensor.dispose();
        }
      });
      this.tensors.length = 0;
      this.idTensor.dispose();
    }

    /**
     * The size of the tensors in the tensor list.
     */
    size() {
      return this.tensors.length;
    }

    /**
     * Return a tensor that stacks a list of rank-R tf.Tensors into one rank-(R+1) tf.Tensor.
     * @param elementShape shape of each tensor
     * @param elementDtype data type of each tensor
     * @param numElements the number of elements to stack
     */
    stack(elementShape: number[], elementDtype: DataType, numElements = -1): Tensor {
      if (elementDtype !== this.elementDtype) {
        throw new Error(`Invalid data types; op elements ${elementDtype}, but list elements ${this.elementDtype}`);
      }
      if (numElements !== -1 && this.tensors.length !== numElements) {
        throw new Error(`Operation expected a list with ${numElements} elements but got a list with ${this.tensors.length} elements.`);
      }
      assertShapesMatchAllowUndefinedSize(
        elementShape, this.elementShape, 'TensorList shape mismatch: ');
      const outputElementShape = inferElementShape(this.elementShape, this.tensors, elementShape);
      return tidy(() => {
        const reshapedTensors = this.tensors.map(tensor => reshape(tensor, outputElementShape));
        return stack(reshapedTensors, 0);
      });
    }

    /**
     * Pop a tensor from the end of the list.
     * @param elementShape shape of the tensor
     * @param elementDtype data type of the tensor
     */
    popBack(elementShape: number[], elementDtype: DataType): Tensor {
      if (elementDtype !== this.elementDtype) {
        throw new Error(`Invalid data types; op elements ${elementDtype}, but list elements ${this.elementDtype}`);
      }
      if (this.size() === 0) {
        throw new Error("Trying to pop from an empty list.");
      }
      const outputElementShape = inferElementShape(this.elementShape, this.tensors, elementShape);
      const tensor = this.tensors.pop();
      assertShapesMatchAllowUndefinedSize(
        tensor.shape, elementShape, 'TensorList shape mismatch: ');
      return reshape(tensor, outputElementShape);
    }

    /**
     * Push a tensor to the end of the list.
     * @param tensor Tensor to be pushed.
     */
    pushBack(tensor: Tensor) {
      if (tensor.dtype !== this.elementDtype) {
        throw new Error(`Invalid data types; op elements ${tensor.dtype}, but list elements ${this.elementDtype}`);
      }
      assertShapesMatchAllowUndefinedSize(
        tensor.shape, this.elementShape, 'TensorList shape mismatch: ');
      if (this.maxNumElements === this.size()) {
        throw new Error(`Trying to push element into a full list.`);
      }
      keep(tensor);
      this.tensors.push(tensor);
    }

    /**
     * Update the size of the list.
     * @param size the new size of the list.
     */
    resize(size: number) {
      if (size < 0) {
        throw new Error(`TensorListResize expects size to be non-negative. Got: ${size}`);
      }
      if (this.maxNumElements !== -1 && size > this.maxNumElements) {
        throw new Error(`TensorListResize input size ${size} is greater than maxNumElement ${this.maxNumElements}.`);
      }
      this.tensors.length = size;
    }

    /**
     * Retrieve the element at the provided index.
     * @param elementShape shape of the tensor
     * @param elementDtype dtype of the tensor
     * @param elementIndex index of the tensor
     */
    getItem(elementIndex: number, elementShape:

```

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number[], elementDtype: DataType):\n    Tensor {\n    if (elementDtype !== this.elementDtype) {\n    throw new
Error(`Invalid data types; op elements ${\n    elementDtype}, but list elements ${this.elementDtype}`);\n    }\n
if (elementIndex < 0 || elementIndex > this.tensors.length) {\n    throw new Error(`Trying to access element ${\n
    elementIndex} in a list with ${this.tensors.length} elements.`);\n    }\n\n    if (this.tensors[elementIndex] == null)
{\n    throw new Error(`element at index ${elementIndex} is null.`);\n    }\n\n
assertShapesMatchAllowUndefinedSize(\n    this.tensors[elementIndex].shape, elementShape,\n    `TensorList
shape mismatch:`);\n    const outputElementShape =\n    inferElementShape(this.elementShape, this.tensors,
elementShape);\n    return reshape(this.tensors[elementIndex], outputElementShape);\n    }\n\n    /**\n    * Set the
tensor at the index\n    * @param elementIndex index of the tensor\n    * @param tensor the tensor to be inserted into
the list\n    */\n    setItem(elementIndex: number, tensor: Tensor) {\n    if (tensor.dtype !== this.elementDtype) {\n
throw new Error(`Invalid data types; op elements ${\n    tensor.dtype}, but list elements
${this.elementDtype}`);\n    }\n\n    if (elementIndex < 0 ||\n    this.maxNumElements !== -1 && elementIndex
>= this.maxNumElements) {\n    throw new Error(`Trying to set element ${\n    elementIndex} in a list with
max ${this.maxNumElements} elements.`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n
this.elementShape, tensor.shape, `TensorList shape mismatch:`);\n    keep(tensor);\n    this.tensors[elementIndex] =
tensor;\n    }\n\n    /**\n    * Return selected values in the TensorList as a stacked Tensor. All of\n    * selected values
must have been written and their shapes must all match.\n    * @param indices indices of tensors to gather\n    *
@param elementDtype output tensor dtype\n    * @param elementShape output tensor element shape\n    */\n
gather(indices: number[], elementDtype: DataType, elementShape: number[]):\n    Tensor {\n    if (elementDtype
!== this.elementDtype) {\n    throw new Error(`Invalid data types; op elements ${\n    elementDtype}, but list
elements ${this.elementDtype}`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n    this.elementShape,
elementShape, `TensorList shape mismatch:`);\n\n    // When indices is greater than the size of the list, indices
beyond the\n    // size of the list are ignored.\n    indices = indices.slice(0, this.size());\n    const outputElementShape
=\n    inferElementShape(this.elementShape, this.tensors, elementShape);\n    if (indices.length === 0) {\n
return tensor([], [0].concat(outputElementShape));\n    }\n\n    return tidy(() => {\n    const tensors =\n
indices.map(i => reshape(this.tensors[i], outputElementShape));\n    return stack(tensors, 0);\n    });\n    }\n\n    /**\n
* Return the values in the TensorList as a concatenated Tensor.\n    * @param elementDtype output tensor dtype\n
* @param elementShape output tensor element shape\n    */\n    concat(elementDtype: DataType, elementShape:
number[]): Tensor {\n    if (!elementDtype && elementDtype !== this.elementDtype) {\n    throw new
Error(`TensorList dtype is ${\n    this.elementDtype} but concat requested dtype ${elementDtype}`);\n    }\n\n
assertShapesMatchAllowUndefinedSize(\n    this.elementShape, elementShape, `TensorList shape mismatch:`);\n\n
const outputElementShape =\n    inferElementShape(this.elementShape, this.tensors, elementShape);\n\n    if
(this.size() === 0) {\n    return tensor([], [0].concat(outputElementShape));\n    }\n\n    return tidy(() => {\n
const tensors = this.tensors.map(t => reshape(t, outputElementShape));\n    return concat(tensors, 0);\n    });\n
}\n\n    /**\n    * Creates a TensorList which, when stacked, has the value of tensor.\n    * @param tensor from tensor\n
* @param elementShape output tensor element shape\n    */\n    nextExportFunctionFromTensor(\n    tensor: Tensor,
elementShape: number[], elementDtype: DataType) {\n    const dtype = tensor.dtype;\n    if (tensor.shape.length < 1)
{\n    throw new Error(\n    `Tensor must be at least a vector, but saw shape: ${tensor.shape}`);\n    }\n    if
(tensor.dtype !== elementDtype) {\n    throw new Error(`Invalid data types; op elements ${\n    tensor.dtype}, but
list elements ${elementDtype}`);\n    }\n    const tensorElementShape = tensor.shape.slice(1);\n
assertShapesMatchAllowUndefinedSize(\n    tensorElementShape, elementShape, `TensorList shape mismatch:
`);\n    const tensorList: Tensor[] = unstack(tensor);\n    return new TensorList(tensorList, elementShape,
dtype);\n    }\n\n    /**\n    * Return a TensorList of the given size with empty elements.\n    * @param elementShape the
shape of the future elements of the list\n    * @param elementDtype the desired type of elements in the list\n    *
@param numElements the number of elements to reserve\n    */\n    nextExportFunctionReserve(\n    elementShape:
number[], elementDtype: DataType, numElements: number) {\n    return new TensorList([], elementShape,
elementDtype, numElements);\n    }\n\n    /**\n    * Put tensors at specific indices of a stacked tensor into a TensorList.\n    *
@param indices list of indices on how to scatter the tensor.\n    * @param tensor input tensor.\n    * @param

```

```

elementShape the shape of the future elements of the list\n * @param numElements the number of elements to
scatter\n * \nexport function scatter(\n  tensor: Tensor, indices: number[], elementShape: number[],\n  numElements?: number): TensorList {\n  if (indices.length !== tensor.shape[0]) {\n    throw new Error(`Expected
len(indices) == tensor.shape[0], but saw: ${\n    indices.length} vs. ${tensor.shape[0]}`);\n  }\n\n  const maxIndex
= Math.max(...indices);\n\n  if (numElements != null && numElements !== -1 && maxIndex >= numElements) {\n
  throw new Error(\n    `Max index must be < array size (${maxIndex} vs. ${numElements})`);\n  }\n\n  const list
= new TensorList([], elementShape, tensor.dtype, numElements);\n  const tensors = unstack(tensor, 0);\n
indices.forEach((value, index) => {\n    list.setItem(value, tensors[index]);\n  });\n  return list;\n}\n\n/**\n * Split the
values of a Tensor into a TensorList.\n * @param length the lengths to use when splitting value along\n * its first
dimension.\n * @param tensor the tensor to split.\n * @param elementShape the shape of the future elements of the
list\n * \nexport function split(\n  tensor: Tensor, length: number[], elementShape: number[]) {\n  let totalLength =
0;\n  const cumulativeLengths = length.map(len => {\n    totalLength += len;\n    return totalLength;\n  });\n\n  if
(totalLength !== tensor.shape[0]) {\n    throw new Error(`Expected sum of lengths to be equal to\n
tensor.shape[0], but sum of lengths is\n    ${totalLength}, and tensor's shape is: ${tensor.shape}`);\n  }\n\n  const
shapeWithoutFirstDim = tensor.shape.slice(1);\n  const outputElementShape =\n  mergeElementShape(shapeWithoutFirstDim, elementShape);\n  const elementPerRow = totalLength === 0 ? 0 :
tensor.size / totalLength;\n  const tensors: Tensor[] = tidy(() => {\n    const tensors = [];\n    tensor = reshape(tensor,
[1, totalLength, elementPerRow]);\n    for (let i = 0; i < length.length; ++i) {\n      const previousLength = (i === 0)
? 0 : cumulativeLengths[i - 1];\n      const indices = [0, previousLength, 0];\n      const sizes = [1, length[i],
elementPerRow];\n      tensors[i] = reshape(\n        slice(tensor, indices, sizes), outputElementShape as number[]);\n
    }\n    tensor.dispose();\n    return tensors;\n  });\n\n  const list = new TensorList([], elementShape, tensor.dtype,
length.length);\n\n  for (let i = 0; i < tensors.length; i++) {\n    list.setItem(i, tensors[i]);\n  }\n  return
list;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an "AS IS"\n
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
===== \n
*\n\nimport {DataType, scalar, Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap} from
'../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {TensorArray} from
'../executor/tensor_array';\nimport {fromTensor, reserve, scatter, split} from '../executor/tensor_list';\nimport
{InternalOpAsyncExecutor, Node} from './types';\nimport {cloneTensor, getParamValue, getTensor} from
'./utils';\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n  node: Node, tensorMap:
NamedTensorsMap,\n  context: ExecutionContext): Promise<Tensor[]> => {\n  switch (node.op) {\n    case 'If':\n    case 'StatelessIf': {\n      const thenFunc =\n        getParamValue('thenBranch', node, tensorMap, context) as
string;\n      const elseFunc =\n        getParamValue('elseBranch', node, tensorMap, context) as string;\n      const
cond = getParamValue('cond', node, tensorMap, context) as Tensor;\n      const args = getParamValue('args', node,
tensorMap, context) as Tensor[];\n      const condValue = await cond.data();\n      if (condValue[0]) {\n        return
context.functionMap[thenFunc].executeFunctionAsync(\n          args, context.tensorArrayMap,
context.tensorListMap);\n      } else {\n        return context.functionMap[elseFunc].executeFunctionAsync(\n
args, context.tensorArrayMap, context.tensorListMap);\n      }\n    }\n    case 'While':\n    case 'StatelessWhile': {\n      const bodyFunc =\n        getParamValue('body', node, tensorMap, context) as string;\n      const condFunc =\n        getParamValue('cond', node, tensorMap, context) as string;\n      const args = getParamValue('args', node,
tensorMap, context) as Tensor[];\n\n      // Calculate the condition of the loop\n      const condResult =\n        (await
context.functionMap[condFunc].executeFunctionAsync(\n          args, context.tensorArrayMap,
context.tensorListMap));\n      const argIds = args.map(tensor => tensor.id);\n      let condValue = await
condResult[0].data();\n      // Dispose the intermediate tensors for condition function\n      condResult.forEach(tensor

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=> {\n    if (!tensor.kept && argIds.indexOf(tensor.id) === -1) {\n        tensor.dispose();\n    }\n}\n\nlet result: Tensor[] = args;\n\nwhile (condValue[0]) {\n    // Record the previous result for intermediate tensor tracking\n    const origResult = result;\n    // Execution the body of the loop\n    result = await context.functionMap[bodyFunc].executeFunctionAsync(\n        result, context.tensorArrayMap, context.tensorListMap);\n    const resultIds = result.map(tensor => tensor.id);\n    // Dispose the intermediate tensor for body function that is not global\n    // kept, not input/output of the body function\n    origResult.forEach(tensor => {\n        if (!tensor.kept && argIds.indexOf(tensor.id) === -1 &&\n            resultIds.indexOf(tensor.id) === -1) {\n            tensor.dispose();\n        }\n    });\n    // Recalculate the condition of the loop using the latest results.\n    const condResult =\n        (await context.functionMap[condFunc].executeFunctionAsync(\n            result, context.tensorArrayMap, context.tensorListMap));\n    condValue = await condResult[0].data();\n    // Dispose the intermediate tensors for condition function\n    condResult.forEach(tensor => {\n        if (!tensor.kept && argIds.indexOf(tensor.id) === -1 &&\n            resultIds.indexOf(tensor.id) === -1) {\n            tensor.dispose();\n        }\n    });\n}\n\nreturn result;\n}\n\n case 'LoopCond': {\n    const pred = getParamValue('pred', node, tensorMap, context) as Tensor;\n    return [cloneTensor(pred)];\n}\n\n case 'Switch': {\n    const pred = getParamValue('pred', node, tensorMap, context) as Tensor;\n    let data = getParamValue('data', node, tensorMap, context) as Tensor;\n    if (!data.kept) {\n        data = cloneTensor(data);\n    }\n    // Outputs nodes :0 => false, :1 => true\n    return (await pred.data())[0] ? [undefined, data] : [data, undefined];\n}\n\n case 'Merge': {\n    const inputName = node.inputNames.find(\n        name => getTensor(name, tensorMap, context) !== undefined);\n    if (inputName) {\n        const data = getTensor(inputName, tensorMap, context);\n        return [cloneTensor(data)];\n    }\n    return undefined;\n}\n\n case 'Enter': {\n    const frameId =\n        getParamValue('frameName', node, tensorMap, context) as string;\n    const data = getParamValue('tensor', node, tensorMap, context) as Tensor;\n    context.enterFrame(frameId);\n    return [cloneTensor(data)];\n}\n\n case 'Exit': {\n    const data =\n        getParamValue('tensor', node, tensorMap, context) as Tensor;\n    context.exitFrame();\n    return [cloneTensor(data)];\n}\n\n case 'NextIteration': {\n    const data = getParamValue('tensor', node, tensorMap, context) as Tensor;\n    context.nextIteration();\n    return [cloneTensor(data)];\n}\n\n case 'TensorArrayV3': {\n    const size = getParamValue('size', node, tensorMap, context) as number;\n    const dtype =\n        getParamValue('dtype', node, tensorMap, context) as DataType;\n    const elementShape =\n        getParamValue('elementShape', node, tensorMap, context) as number[];\n    const dynamicSize =\n        getParamValue('dynamicSize', node, tensorMap, context) as boolean;\n    const clearAfterRead =\n        getParamValue('clearAfterRead', node, tensorMap, context) as boolean;\n    const identicalElementShapes =\n        getParamValue('identicalElementShapes', node, tensorMap, context) as\n        boolean;\n    const name =\n        getParamValue('name', node, tensorMap, context) as string;\n    const tensorArray = new TensorArray(\n        name, dtype, size, elementShape, identicalElementShapes, dynamicSize,\n        clearAfterRead);\n    context.addTensorArray(tensorArray);\n    return [tensorArray.idTensor, scalar(1.0)];\n}\n\n case 'TensorArrayWriteV3': {\n    const id =\n        getParamValue('tensorArrayId', node, tensorMap, context) as\n        Tensor;\n    const index = getParamValue('index', node, tensorMap, context) as number;\n    const writeTensor =\n        getParamValue('tensor', node, tensorMap, context) as Tensor;\n    const writeTensorArray =\n        context.getTensorArray(id.id);\n    writeTensorArray.write(index, writeTensor);\n    return [writeTensorArray.idTensor];\n}\n\n case 'TensorArrayReadV3': {\n    const readId =\n        getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n    const readIndex =\n        getParamValue('index', node, tensorMap, context) as number;\n    const readTensorArray =\n        context.getTensorArray(readId.id);\n    return [readTensorArray.read(readIndex)];\n}\n\n case 'TensorArrayGatherV3': {\n    const gatherId =\n        getParamValue('tensorArrayId', node, tensorMap, context) as\n        Tensor;\n    const gatherIndices =\n        getParamValue('indices', node, tensorMap, context) as number[];\n    const gatherDtype =\n        getParamValue('dtype', node, tensorMap, context) as DataType;\n    const gatherTensorArray = context.getTensorArray(gatherId.id);\n    return [gatherTensorArray.gather(gatherIndices, gatherDtype)];\n}\n\n case 'TensorArrayScatterV3': {\n    const scatterId =\n

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getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n    const scatterIndices =\n
getParamValue('indices', node, tensorMap, context) as number[];\n    const scatterTensor =\n
getParamValue('tensor', node, tensorMap, context) as Tensor;\n    const scatterTensorArray =
context.getTensorArray(scatterId.id);\n    scatterTensorArray.scatter(scatterIndices, scatterTensor);\n    return
[scatterTensorArray.idTensor];\n    }\n    case 'TensorArrayConcatV3': {\n    const concatId =\n
getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n    const concatTensorArray =
context.getTensorArray(concatId.id);\n    const concatDtype =\n        getParamValue('dtype', node, tensorMap,
context) as DataType;\n    return [concatTensorArray.concat(concatDtype)];\n    }\n    case 'TensorArraySplitV3':
{\n    const splitId =\n        getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n    const
splitTensor =\n        getParamValue('tensor', node, tensorMap, context) as Tensor;\n    const lengths =\n
getParamValue('lengths', node, tensorMap, context) as number[];\n    const splitTensorArray =
context.getTensorArray(splitId.id);\n    splitTensorArray.split(lengths, splitTensor);\n    return
[splitTensorArray.idTensor];\n    }\n    case 'TensorArraySizeV3': {\n    const sizeId =\n
getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n    const sizeTensorArray =
context.getTensorArray(sizeId.id);\n    return [scalar(sizeTensorArray.size(), 'int32')];\n    }\n    case
'TensorArrayCloseV3': {\n    const closeId =\n        getParamValue('tensorArrayId', node, tensorMap, context) as
Tensor;\n    const closeTensorArray = context.getTensorArray(closeId.id);\n
closeTensorArray.clearAndClose();\n    return [closeTensorArray.idTensor];\n    }\n    case 'TensorListSetItem': {\n
const idTensor =\n        getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n    const index =
getParamValue('index', node, tensorMap, context) as number;\n    const writeTensor =\n
getParamValue('tensor', node, tensorMap, context) as Tensor;\n    const tensorList =
context.getTensorList(idTensor.id);\n    tensorList.setItem(index, writeTensor);\n    return [tensorList.idTensor];\n
    }\n    case 'TensorListGetItem': {\n    const idTensor =\n        getParamValue('tensorListId', node, tensorMap,
context) as Tensor;\n    const readIndex =\n        getParamValue('index', node, tensorMap, context) as number;\n
const elementShape =\n        getParamValue('elementShape', node, tensorMap, context) as number[];\n\n    const
elementDType =\n        getParamValue('elementDType', node, tensorMap, context) as DataType;\n    const
tensorList = context.getTensorList(idTensor.id);\n    return [tensorList.getItem(readIndex, elementShape,
elementDType)];\n    }\n    case 'TensorListScatterV2':\n    case 'TensorListScatter': {\n    const scatterIndices =\n
getParamValue('indices', node, tensorMap, context) as number[];\n    const scatterTensor =\n
getParamValue('tensor', node, tensorMap, context) as Tensor;\n    const elementShape =\n
getParamValue('elementShape', node, tensorMap, context) as number[];\n    const numElements =\n
getParamValue('numElements', node, tensorMap, context) as number;\n    const tensorList =\n
scatter(scatterTensor, scatterIndices, elementShape, numElements);\n    context.addTensorList(tensorList);\n
return [tensorList.idTensor];\n    }\n    case 'TensorListReserve':\n    case 'EmptyTensorList': {\n    const
elementShape =\n        getParamValue('elementShape', node, tensorMap, context) as number[];\n    const
elementDtype =\n        getParamValue('elementDType', node, tensorMap, context) as DataType;\n    let
numElementsParam;\n    if (node.op === 'TensorListReserve') {\n    numElementsParam = 'numElements';\n
    } else {\n    numElementsParam = 'maxNumElements';\n    }\n\n    const numElements =\n
getParamValue(numElementsParam, node, tensorMap, context) as number;\n\n    const tensorList =
reserve(elementShape, elementDtype, numElements);\n    context.addTensorList(tensorList);\n    return
[tensorList.idTensor];\n    }\n    case 'TensorListGather': {\n    const gatherId =\n
getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n    const gatherIndices =\n
getParamValue('indices', node, tensorMap, context) as number[];\n    const elementShape =\n
getParamValue('elementShape', node, tensorMap, context) as number[];\n    const elementDtype =\n
getParamValue('elementDType', node, tensorMap, context) as DataType;\n    const tensorList =
context.getTensorList(gatherId.id);\n    return [tensorList.gather(gatherIndices, elementDtype, elementShape)];\n
    }\n    case 'TensorListStack': {\n    const idTensor =\n        getParamValue('tensorListId', node, tensorMap,
context) as Tensor;\n    const elementShape =\n        getParamValue('elementShape', node, tensorMap, context) as

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number[];\n  const elementDType =\n    getParamValue('elementDType', node, tensorMap, context) as
DataType;\n  const numElements =\n    getParamValue('numElements', node, tensorMap, context) as
number;\n  const tensorList = context.getTensorList(idTensor.id);\n  return [tensorList.stack(elementShape,
elementDType, numElements)];\n } \n case 'TensorListFromTensor': {\n  const tensor =\n    getParamValue('tensor', node, tensorMap, context) as Tensor;\n  const elementShape =\n    getParamValue('elementShape', node, tensorMap, context) as number[];\n  const elementDType =\n    getParamValue('elementDType', node, tensorMap, context) as DataType;\n  const tensorList =
fromTensor(tensor, elementShape, elementDType);\n  context.addTensorList(tensorList);\n  return
[tensorList.idTensor];\n } \n case 'TensorListConcat': {\n  const concatId =\n    getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n  const tensorList =
context.getTensorList(concatId.id);\n  const concatDType =\n    getParamValue('dtype', node, tensorMap,
context) as DataType;\n  const elementShape =\n    getParamValue('elementShape', node, tensorMap, context)
as number[];\n  return [tensorList.concat(concatDType, elementShape)];\n } \n case 'TensorListPushBack': {\n
const idTensor =\n    getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n  const
writeTensor =\n    getParamValue('tensor', node, tensorMap, context) as Tensor;\n  const tensorList =
context.getTensorList(idTensor.id);\n  tensorList.pushBack(writeTensor);\n  return [tensorList.idTensor];\n } \n case 'TensorListPopBack': {\n  const idTensor =\n    getParamValue('tensorListId', node, tensorMap,
context) as Tensor;\n  const elementShape =\n    getParamValue('elementShape', node, tensorMap, context) as
number[];\n  const elementDType =\n    getParamValue('elementDType', node, tensorMap, context) as
DataType;\n  const tensorList = context.getTensorList(idTensor.id);\n  return
[tensorList.popBack(elementShape, elementDType)];\n } \n case 'TensorListSplit': {\n  const splitTensor =\n    getParamValue('tensor', node, tensorMap, context) as Tensor;\n  const elementShape =\n    getParamValue('elementShape', node, tensorMap, context) as number[];\n  const lengths =\n    getParamValue('lengths', node, tensorMap, context) as number[];\n  const tensorList = split(splitTensor, lengths,
elementShape);\n  context.addTensorList(tensorList);\n  return [tensorList.idTensor];\n } \n default:\n  throw TypeError('Node type ${node.op} is not implemented');\n } \n};\n\nexport const CATEGORY =
'control';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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*\n\nimport {Rank, Tensor, Tensor3D, Tensor4D, Tensor5D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-
line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport
{NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from
'../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getPadding,
getParamValue} from './utils';\n\nfunction fusedConvAndDepthWiseParams(\n  node: Node, tensorMap:
NamedTensorsMap, context: ExecutionContext) {\n  const [extraOp, activationFunc] =\n    (getParamValue('fusedOps', node, tensorMap, context) as string[]);\n  const isBiasAdd = extraOp === 'biasadd';\n  const isPrelu = activationFunc === 'prelu';\n  const isBatchNorm = extraOp === 'fusedbatchnorm';\n  const
numArgs =\n    (getParamValue('numArgs', node, tensorMap, context) as number);\n  if (isBiasAdd) {\n    if
(isPrelu && numArgs !== 2) {\n      throw new Error(\n        'FusedConv2d and DepthwiseConv2d with BiasAdd
and Prelu ' +\n        'must have two extra arguments: bias and alpha.);\n    }\n    if (!isPrelu && numArgs !== 1) {\n
      throw new Error(\n        'FusedConv2d and DepthwiseConv2d with BiasAdd must have ' +\n        'one extra
argument: bias.);\n    }\n  }\n  if (isBatchNorm) {\n    throw new Error(\n      'FusedConv2d and DepthwiseConv2d
with FusedBatchNorm is not supported.);\n  }\n  const stride = getParamValue('strides', node, tensorMap, context)

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as number[];\n const pad = getPadding(node, tensorMap, context);\n const dataFormat =\n
(getParamValue('dataFormat', node, tensorMap, context) as string)\n      .toUpperCase();\n const dilations =\n
getParamValue('dilations', node, tensorMap, context) as number[];\n const [biasArg, preluArg] =\n
getParamValue('args', node, tensorMap, context) as Tensor[];\n const leakyreluAlpha =\n
getParamValue('leakyreluAlpha', node, tensorMap, context) as number;\n\n return {\n  stride,\n  pad,\n
dataFormat,\n  dilations,\n  biasArg,\n  preluArg,\n  activationFunc,\n  leakyreluAlpha\n };}\n\nexport const
executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context:
ExecutionContext): Tensor[] => {\n  switch (node.op) {\n    case 'Conv1D': {\n      const stride =\n
getParamValue('stride', node, tensorMap, context) as number;\n      const pad = getParamValue('pad', node,
tensorMap, context);\n      const dataFormat =\n
(getParamValue('dataFormat', node, tensorMap, context)
as string)\n        .toUpperCase();\n      const dilation =\n
getParamValue('dilation', node, tensorMap,
context) as number;\n      return [tfOps.conv1d(\n
getParamValue('x', node, tensorMap, context) as
Tensor3D,\n
getParamValue('filter', node, tensorMap, context) as Tensor3D,\n
stride, pad as 'valid' |
'same', dataFormat as 'NWC' | 'NCW',\n
dilation)];\n    }\n    case 'Conv2D': {\n      const stride =\n
getParamValue('strides', node, tensorMap, context) as number[];\n      const pad = getPadding(node,
tensorMap, context);\n      const dataFormat =\n
(getParamValue('dataFormat', node, tensorMap, context)
as string)\n        .toUpperCase();\n      const dilations =\n
getParamValue('dilations', node,
tensorMap, context) as number[];\n      return [tfOps.conv2d(\n
getParamValue('x', node, tensorMap,
context) as Tensor3D |\n
Tensor4D,\n
getParamValue('filter', node, tensorMap, context) as
Tensor4D,\n
[stride[1], stride[2]], pad as 'valid' | 'same',\n
dataFormat as 'NHWC' | 'NCHW',
[dilations[1], dilations[2]]);\n    }\n    case '_FusedConv2D': {\n      const {\n        stride,\n        pad,\n
dataFormat,\n        dilations,\n        biasArg,\n        preluArg,\n        activationFunc,\n
leakyreluAlpha\n      } = fusedConvAndDepthWiseParams(node, tensorMap, context);\n\n      return
[tfOps.fused.conv2d({\n        x: getParamValue('x', node, tensorMap, context) as Tensor3D |\n
Tensor4D,\n        filter: getParamValue('filter', node, tensorMap, context) as\n
Tensor4D,\n
strides: [stride[1], stride[2]],\n        pad: pad as 'valid' | 'same',\n        dataFormat: dataFormat as 'NHWC' |
'NCHW',\n        dilations: [dilations[1], dilations[2]],\n        bias: biasArg,\n        activation: activationFunc as
tfOps.fused.Activation,\n        preluActivationWeights: preluArg,\n        leakyreluAlpha\n      })];\n    }\n    case 'FusedDepthwiseConv2dNative': {\n      const {\n        stride,\n        pad,\n
dataFormat,\n        dilations,\n        biasArg,\n        preluArg,\n        activationFunc,\n
leakyreluAlpha,\n      } =
fusedConvAndDepthWiseParams(node, tensorMap, context);\n\n      return [tfOps.fused.depthwiseConv2d({\n
x: getParamValue('x', node, tensorMap, context) as Tensor3D |\n
Tensor4D,\n        filter:
getParamValue('filter', node, tensorMap, context) as\n
Tensor4D,\n        strides: [stride[1], stride[2]],\n        pad: pad as 'valid' | 'same',\n        dataFormat: dataFormat as 'NHWC' | 'NCHW',\n        dilations:
[dilations[1], dilations[2]],\n        bias: biasArg,\n        activation: activationFunc as tfOps.fused.Activation,\n
preluActivationWeights: preluArg,\n        leakyreluAlpha\n      })];\n    }\n    case
'Conv2DBackpropInput':\n    case 'Conv2dTranspose': {\n      const shape = getParamValue(\n
'outputShape', node, tensorMap,\n        context) as [number, number, number] |\n
[number,
number, number, number];\n      const stride =\n
getParamValue('strides', node, tensorMap, context) as
number[];\n      const pad = getPadding(node, tensorMap, context);\n      return [tfOps.conv2dTranspose(\n
getParamValue('x', node, tensorMap, context) as Tensor3D |\n
Tensor4D,\n
getParamValue('filter', node, tensorMap, context) as Tensor4D,\n
shape, [stride[1], stride[2]], pad as 'valid' |
'same')];\n    }\n    case 'DepthwiseConv2dNative':\n    case 'DepthwiseConv2d': {\n      const stride =\n
getParamValue('strides', node, tensorMap, context) as number[];\n      const pad = getPadding(node,
tensorMap, context);\n      const dilations =\n
getParamValue('dilations', node, tensorMap, context) as
number[];\n      const dataFormat =\n
(getParamValue('dataFormat', node, tensorMap, context) as string)\n
        .toUpperCase();\n\n      return [tfOps.depthwiseConv2d(\n
getParamValue('input', node,
tensorMap, context) as Tensor3D |\n
Tensor4D,\n
getParamValue('filter', node, tensorMap,

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context) as Tensor4D,\n        [stride[1], stride[2]], pad as 'valid' | 'same',\n        dataFormat as 'NHWC' |
'NCHW', [dilations[1], dilations[2]]);\n    }\n    case 'Conv3D': {\n        const stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad = getParamValue('pad', node,\n        tensorMap, context);\n        const dataFormat =\n        (getParamValue('dataFormat', node, tensorMap, context)\n        as string)\n        .toUpperCase();\n        const dilations =\n        getParamValue('dilations', node,\n        tensorMap, context) as number[];\n        return [tfOps.conv3d(\n        getParamValue('x', node, tensorMap,\n        context) as Tensor4D |\n        Tensor<Rank.R5>,\n        getParamValue('filter', node, tensorMap, context)\n        as\n        Tensor<Rank.R5>,\n        [stride[1], stride[2], stride[3]], pad as 'valid' | 'same',\n        dataFormat as 'NDHWC' | 'NCDHW',\n        [dilations[1], dilations[2], dilations[3]]);\n    }\n    case\n    'AvgPool': {\n        const stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad = getParamValue('pad', node, tensorMap, context);\n        const kernelSize =\n        getParamValue('kernelSize', node, tensorMap, context) as number[];\n        return [tfOps.avgPool(\n        getParamValue('x', node, tensorMap, context) as Tensor3D |\n        Tensor4D,\n        [kernelSize[1],\n        kernelSize[2]], [stride[1], stride[2]],\n        pad as 'valid' | 'same');\n    }\n    case 'MaxPool': {\n        const\n        stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad =\n        getParamValue('pad', node, tensorMap, context);\n        const kernelSize =\n        getParamValue('kernelSize',\n        node, tensorMap, context) as number[];\n        return [tfOps.maxPool(\n        getParamValue('x', node,\n        tensorMap, context) as Tensor3D |\n        Tensor4D,\n        [kernelSize[1], kernelSize[2]], [stride[1],\n        stride[2]],\n        pad as 'valid' | 'same');\n    }\n    case 'MaxPoolWithArgmax': {\n        const stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad = getParamValue('pad', node,\n        tensorMap, context);\n        const kernelSize =\n        getParamValue('kernelSize', node, tensorMap, context) as\n        number[];\n        const includeBatchInIndex =\n        getParamValue('includeBatchInIndex', node, tensorMap,\n        context) as\n        boolean;\n        const {result, indexes} = tfOps.maxPoolWithArgmax(\n        getParamValue('x', node, tensorMap, context) as Tensor4D,\n        [kernelSize[1], kernelSize[2]], [stride[1],\n        stride[2]],\n        pad as 'valid' | 'same', includeBatchInIndex);\n        return [result, indexes];\n    }\n    case\n    'AvgPool3D': {\n        const stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad = getParamValue('pad', node, tensorMap, context);\n        const kernelSize =\n        getParamValue('kernelSize', node, tensorMap, context) as number[];\n        return [tfOps.avgPool3d(\n        getParamValue('x', node, tensorMap, context) as Tensor5D,\n        [kernelSize[1], kernelSize[2],\n        kernelSize[3]],\n        [stride[1], stride[2], stride[3]], pad as 'valid' | 'same');\n    }\n    }\n    case 'MaxPool3D':\n    {\n        const stride =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad\n        =\n        getParamValue('pad', node, tensorMap, context);\n        const kernelSize =\n        getParamValue('kernelSize',\n        node, tensorMap, context) as number[];\n        return [tfOps.maxPool3d(\n        getParamValue('x', node,\n        tensorMap, context) as Tensor5D,\n        [kernelSize[1], kernelSize[2], kernelSize[3]],\n        [stride[1],\n        stride[2], stride[3]], pad as 'valid' | 'same');\n    }\n    }\n    case 'Dilation2D': {\n        const strides =\n        getParamValue('strides', node, tensorMap, context) as number[];\n        const pad = getParamValue('pad', node,\n        tensorMap, context);\n        const dilations =\n        getParamValue('dilations', node, tensorMap, context) as\n        number[];\n        // strides: [1, stride_height, stride_width, 1].\n        const strideHeight = strides[1];\n        const\n        strideWidth =\n        strides[2];\n        // dilations: [1, dilation_height, dilation_width, 1].\n        const dilationHeight =\n        dilations[1];\n        const dilationWidth = dilations[2];\n        return [tfOps.dilation2d(\n        getParamValue('x', node, tensorMap, context) as Tensor3D |\n        Tensor4D,\n        getParamValue('filter', node, tensorMap, context) as Tensor3D,\n        [strideHeight, strideWidth], pad as 'valid' |\n        'same',\n        [dilationHeight, dilationWidth], 'NHWC' /* dataFormat */);\n    }\n    }\n    default:\n        throw\n        TypeError(`Node type ${node.op} is not implemented`);\n    }\n    };\n\nexport const CATEGORY =\n'convolution';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the\n Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the\n License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\n\nimport {DataType, Tensor, Tensor1D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n  (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[] => {\n    switch (node.op) {\n      case 'Fill': {\n        const shape =\n          getParamValue('shape', node, tensorMap, context) as number[];\n        const dtype =\n          getParamValue('dtype', node, tensorMap, context) as DataType;\n        const value =\n          getParamValue('value', node, tensorMap, context) as number;\n        return [tfOps.fill(shape, value, dtype)];\n      }\n      case 'LinSpace': {\n        const start =\n          getParamValue('start', node, tensorMap, context) as number;\n        const stop =\n          getParamValue('stop', node, tensorMap, context) as number;\n        const num =\n          getParamValue('num', node, tensorMap, context) as number;\n        return [tfOps.linspace(start, stop, num)];\n      }\n      case 'Multinomial': {\n        const logits =\n          getParamValue('logits', node, tensorMap, context) as Tensor1D;\n        const numSamples =\n          getParamValue('numSamples', node, tensorMap, context) as number;\n        const seed =\n          getParamValue('seed', node, tensorMap, context) as number;\n        return [tfOps.multinomial(logits, numSamples, seed)];\n      }\n      case 'OneHot': {\n        const indices =\n          getParamValue('indices', node, tensorMap, context) as Tensor1D;\n        const depth =\n          getParamValue('depth', node, tensorMap, context) as number;\n        const onValue =\n          getParamValue('onValue', node, tensorMap, context) as number;\n        const offValue =\n          getParamValue('offValue', node, tensorMap, context) as number;\n        return [tfOps.oneHot(indices, depth, onValue, offValue)];\n      }\n      case 'Ones': {\n        return [tfOps.ones(\n          getParamValue('shape', node, tensorMap, context) as number[],\n          getParamValue('dtype', node, tensorMap, context) as DataType)];\n      }\n      case 'OnesLike': {\n        return [tfOps.onesLike(\n          getParamValue('x', node, tensorMap, context) as Tensor)];\n      }\n      case 'RandomUniform': {\n        return [tfOps.randomUniform(\n          // tslint:disable-next-line: no-any\n          getParamValue('shape', node, tensorMap, context) as any,\n          getParamValue('minval', node, tensorMap, context) as number,\n          getParamValue('maxval', node, tensorMap, context) as number,\n          getParamValue('dtype', node, tensorMap, context) as DataType)];\n      }\n      case 'Range': {\n        const start =\n          getParamValue('start', node, tensorMap, context) as number;\n        const stop =\n          getParamValue('stop', node, tensorMap, context) as number;\n        const step =\n          getParamValue('step', node, tensorMap, context) as number;\n        return [tfOps.range(\n          start, stop, step,\n          getParamValue('dtype', node, tensorMap, context) as 'float32' |\n            'int32')];\n      }\n      case 'TruncatedNormal': {\n        const shape =\n          getParamValue('shape', node, tensorMap, context) as number[];\n        const mean =\n          getParamValue('mean', node, tensorMap, context) as number;\n        const stdDev =\n          getParamValue('stdDev', node, tensorMap, context) as number;\n        const seed =\n          getParamValue('seed', node, tensorMap, context) as number;\n        return [tfOps.truncatedNormal(\n          shape, mean, stdDev,\n          getParamValue('dtype', node, tensorMap, context) as 'float32' |\n            'int32',\n          seed)];\n      }\n      case 'Zeros': {\n        return [tfOps.zeros(\n          getParamValue('shape', node, tensorMap, context) as number[],\n          getParamValue('dtype', node, tensorMap, context) as DataType)];\n      }\n      case 'ZerosLike': {\n        return [tfOps.zerosLike(\n          getParamValue('x', node, tensorMap, context) as Tensor)];\n      }\n      default:\n        throw TypeError(`Node type ${node.op} is not implemented`);\n    }\n  };\n\nexport const CATEGORY = 'creation';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=====\n*\n\nimport {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpAsyncExecutor, Node} from '../types';\nimport {getParamValue} from './utils';\n\nfunction nmsParams(\n  node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext) {\n  const boxes = getParamValue('boxes', node, tensorMap, context) as Tensor;\n  const scores = getParamValue('scores', node, tensorMap, context) as Tensor;\n  const maxOutputSize =\n    getParamValue('maxOutputSize', node, tensorMap, context) as number;\n  const iouThreshold =\n    getParamValue('iouThreshold', node, tensorMap, context) as number;\n  const scoreThreshold =\n    getParamValue('scoreThreshold', node, tensorMap, context) as number;\n  const softNmsSigma =\n    getParamValue('softNmsSigma', node, tensorMap, context) as number;\n  \n  return {\n    boxes,\n    scores,\n    maxOutputSize,\n    iouThreshold,\n    scoreThreshold,\n    softNmsSigma\n  }; \n}\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n  node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Promise<Tensor[]> => {\n  switch (node.op) {\n    case 'NonMaxSuppressionV5': {\n      const {\n        boxes,\n        scores,\n        maxOutputSize,\n        iouThreshold,\n        scoreThreshold,\n        softNmsSigma\n      } = nmsParams(node, tensorMap, context);\n      const result = await\n        tfOps.image.nonMaxSuppressionWithScoreAsync(\n          boxes as Tensor2D, scores as Tensor1D, maxOutputSize,\n          iouThreshold,\n          scoreThreshold, softNmsSigma);\n      return [result.selectedIndices,\n        result.selectedScores];\n    }\n    case 'NonMaxSuppressionV4': {\n      const {boxes, scores, maxOutputSize,\n        iouThreshold, scoreThreshold} =\n        nmsParams(node, tensorMap, context);\n      const padToMaxOutputSize =\n        getParamValue('padToMaxOutputSize', node, tensorMap, context) as\n          boolean;\n      const result =\n        await tfOps.image.nonMaxSuppressionPaddedAsync(\n          boxes as Tensor2D, scores as Tensor1D,\n          maxOutputSize, iouThreshold,\n          scoreThreshold, padToMaxOutputSize);\n      return [result.selectedIndices,\n        result.validOutputs];\n    }\n    case 'NonMaxSuppressionV3':\n    case 'NonMaxSuppressionV2': {\n      const {boxes, scores, maxOutputSize, iouThreshold, scoreThreshold} =\n        nmsParams(node, tensorMap, context);\n      return [await tfOps.image.nonMaxSuppressionAsync(\n        boxes as Tensor2D, scores as\n        Tensor1D, maxOutputSize, iouThreshold,\n        scoreThreshold)];\n    }\n    case 'Where': {\n      const condition =\n        tfOps.cast(\n          (getParamValue('condition', node, tensorMap, context) as Tensor),\n          'bool');\n      const result = [await tfOps.whereAsync(condition)];\n      condition.dispose();\n      return result;\n    }\n    case 'ListDiff':\n      return tfOps.setdiff1dAsync(\n        getParamValue('x', node, tensorMap, context) as Tensor,\n        getParamValue('y', node, tensorMap, context) as Tensor);\n    default:\n      throw TypeError('Node type\n      ${node.op} is not implemented');\n  }\n};\n\nexport const CATEGORY = 'dynamic';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or\n * agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n*\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from\n  '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n  (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext):\n  Tensor[] => {\n  switch
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(node.op) {\n      case 'TopKV2': {\n          const x = getParamValue('x', node, tensorMap, context) as
Tensor;\n          const k = getParamValue('k', node, tensorMap, context) as number;\n          const sorted =\n            getParamValue('sorted', node, tensorMap, context) as boolean;\n            const result = tfOps.topk(x, k,
sorted);\n            return [result.values, result.indices];\n          }\n      case 'Unique': {\n          const x =
getParamValue('x', node, tensorMap, context) as Tensor;\n          const result = tfOps.unique(x);\n          return
[result.values, result.indices];\n        }\n      case 'UniqueV2': {\n          const x = getParamValue('x', node,
tensorMap, context) as Tensor;\n          const axis =\n            getParamValue('axis', node, tensorMap, context)
as number;\n          const result = tfOps.unique(x, axis);\n          return [result.values, result.indices];\n        }\n      default:\n        throw TypeError(`Node type ${node.op} is not implemented`);\n      }\n};\n\nexport const CATEGORY = 'evaluation';\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as
tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap} from
'../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {InternalOpExecutor,
Node} from './types';\nimport {cloneTensor, getParamValue, getTensor} from './utils';\n\nexport const executeOp:
InternalOpExecutor =\n  (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext): Tensor[]
=> {\n    switch (node.op) {\n      case 'Const': {\n        return tensorMap[node.name];\n      }\n      case
'PlaceholderWithDefault':\n        const def =\n          getParamValue('default', node, tensorMap, context) as
Tensor;\n        return [getTensor(node.name, tensorMap, context) || def];\n      case 'Placeholder':\n        return
[getTensor(node.name, tensorMap, context)];\n      case 'Identity':\n        case 'StopGradient':\n        case
'FakeQuantWithMinMaxVars': { // This op is currently ignored.\n          const data = getParamValue('x', node,
tensorMap, context) as Tensor;\n          return [cloneTensor(data)];\n        }\n      case 'IdentityN':\n        return
(getParamValue('x', node, tensorMap, context) as Tensor[])\n          .map((t: Tensor) => cloneTensor(t));\n      case
'Snapshot':\n        const snapshot =\n          (getParamValue('x', node, tensorMap, context) as Tensor);\n        return
[cloneTensor(snapshot)];\n      case 'Shape':\n        return [tfOps.tensorId(\n          (getParamValue('x',
node, tensorMap, context) as Tensor).shape,\n          'int32')];\n      case 'ShapeN':\n        return
(getParamValue('x', node, tensorMap, context) as Tensor[])\n          .map((t: Tensor) =>
tfOps.tensorId(t.shape));\n      case 'Size':\n        return [tfOps.scalar(\n          (getParamValue('x', node,
tensorMap, context) as Tensor).size,\n          'int32')];\n      case 'Rank':\n        return [tfOps.scalar(\n
(getParamValue('x', node, tensorMap, context) as Tensor).rank,\n          'int32')];\n      case 'NoOp':\n        return
[tfOps.scalar(1)];\n      case 'Print':\n        const input = getParamValue('x', node, tensorMap, context) as Tensor;\n
const data =\n          getParamValue('data', node, tensorMap, context) as Tensor[];\n        const message =\n          getParamValue('message', node, tensorMap, context) as string;\n        const summarize =\n          getParamValue('summarize', node, tensorMap, context) as number;\n        console.warn(\n          'The graph has a
tf.print() operation, '\n          +\n          'usually used for debugging, which slows down performance.);\n        console.log(message);\n        for (let i = 0; i < data.length; i++) {\n
console.log(Array.prototype.slice.call(data[i].dataSync())\n          .slice(0, summarize));\n        }\n        return
[input];\n      default:\n        throw TypeError(`Node type ${node.op} is not implemented`);\n      }\n    };\n\nexport const CATEGORY = 'graph';\n\n"/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

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'././executor/hash_table';\nimport {ResourceManager} from '././executor/resource_manager';\nimport
{InternalOpAsyncExecutor, Node} from './types';\n\nimport {getParamValue} from './utils';\n\nexport const
executeOp: InternalOpAsyncExecutor = async(\n  node: Node, tensorMap: NamedTensorsMap, context:
ExecutionContext,\n  resourceManager: ResourceManager): Promise<Tensor[]> => {\n  switch (node.op) {\n
case 'HashTable':\n  case 'HashTableV2': {\n  const keyDType =\n  getParamValue('keyDType', node,
tensorMap, context) as DataType;\n  const valueDType =\n  getParamValue('valueDType', node, tensorMap,
context) as DataType;\n\n  const hashTable = new HashTable(keyDType, valueDType);\n
resourceManager.addHashTable(node.name, hashTable);\n  return [hashTable.handle];\n  }\n  case
'LookupTableImport':\n  case 'LookupTableImportV2': {\n  const handle = getParamValue(\n
'tableHandle', node, tensorMap, context,\n  resourceManager) as Tensor;\n  const keys =
getParamValue('keys', node, tensorMap, context) as Tensor;\n  const values =\n  getParamValue('values',
node, tensorMap, context) as Tensor;\n\n  const hashTable = resourceManager.getHashTableById(handle.id);\n
return [await hashTable.import(keys, values)];\n  }\n  case 'LookupTableFind':\n  case 'LookupTableFindV2':
{\n  const handle = getParamValue(\n  'tableHandle', node, tensorMap, context,\n
resourceManager) as Tensor;\n  const keys = getParamValue('keys', node, tensorMap, context) as Tensor;\n
const defaultValue =\n  getParamValue('defaultValue', node, tensorMap, context) as Tensor;\n\n  const
hashTable = resourceManager.getHashTableById(handle.id);\n  return [await hashTable.find(keys,
defaultValue)];\n  }\n  default:\n  throw TypeError('Node type ${node.op} is not implemented');\n
}\n};\n\nexport const CATEGORY = 'hash_table';\n\n",/**\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *\n
=====\n
*/\n\nimport {Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D} from '@tensorflow/tfjs-core';\n\n// tslint:disable-
next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-
core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '././data/types';\nimport
{ExecutionContext} from '././executor/execution_context';\nimport {InternalOpExecutor, Node} from
'./types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node:
Node, tensorMap: NamedTensorsMap,\n  context: ExecutionContext): Tensor[] => {\n  switch (node.op) {\n
case 'ResizeBilinear': {\n  const images =\n  getParamValue('images', node, tensorMap, context) as
Tensor;\n  const size =\n  getParamValue('size', node, tensorMap, context) as number[];\n  const
alignCorners =\n  getParamValue('alignCorners', node, tensorMap, context) as\n  boolean;\n  const
halfPixelCenters =\n  getParamValue('halfPixelCenters', node, tensorMap, context) as\n  boolean;\n
return [tfOps.image.resizeBilinear(\n  images as Tensor3D | Tensor4D, [size[0], size[1]],
alignCorners,\n  halfPixelCenters)];\n  }\n  case 'ResizeNearestNeighbor': {\n  const images =\n
getParamValue('images', node, tensorMap, context) as Tensor;\n  const size =\n
getParamValue('size', node, tensorMap, context) as number[];\n  const alignCorners =\n
getParamValue('alignCorners', node, tensorMap, context) as\n  boolean;\n  const halfPixelCenters =\n
getParamValue('halfPixelCenters', node, tensorMap, context) as\n  boolean;\n  return
[tfOps.image.resizeNearestNeighbor(\n  images as Tensor3D | Tensor4D, [size[0], size[1]], alignCorners,\n
halfPixelCenters)];\n  }\n  case 'CropAndResize': {\n  const image =\n
getParamValue('image', node, tensorMap, context) as Tensor;\n  const boxes =\n
getParamValue('boxes', node, tensorMap, context) as Tensor;\n  const boxInd =\n
getParamValue('boxInd', node, tensorMap, context) as Tensor;\n  const cropSize =\n
getParamValue('cropSize', node, tensorMap, context) as number[];\n  const method =\n

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getParamValue('method', node, tensorMap, context) as string;\n    const extrapolationValue =\n
getParamValue('extrapolationValue', node, tensorMap, context) as\n        number;\n    return
[tfOps.image.cropAndResize(\n        image as Tensor4D, boxes as Tensor2D, boxInd as Tensor1D,\n
cropSize as [number, number], method as 'bilinear' | 'nearest',\n        extrapolationValue)];\n    }\n
default:\n    throw TypeError(`Node type ${node.op} is not implemented`);\n    }\n};\n\nexport const
CATEGORY = 'image';\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an "AS IS" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====\n
*/\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as
tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from
'./../data/types';\nimport {ExecutionContext} from './../executor/execution_context';\nimport {InternalOpExecutor,
Node} from './types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n
(node: Node, tensorMap: NamedTensorsMap,\n    context: ExecutionContext): Tensor[] => {\n    switch
(node.op) {\n        case 'Equal': {\n            return [tfOps.equal(\n                getParamValue('a', node, tensorMap,
context) as Tensor,\n                getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        case
'NotEqual': {\n            return [tfOps.notEqual(\n                getParamValue('a', node, tensorMap, context) as Tensor,\n
                getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        case 'Greater': {\n            return
[tfOps.greater(\n                getParamValue('a', node, tensorMap, context) as Tensor,\n                getParamValue('b',
node, tensorMap, context) as Tensor)];\n        }\n        case 'GreaterEqual': {\n            return [tfOps.greaterEqual(\n
                getParamValue('a', node, tensorMap, context) as Tensor,\n                getParamValue('b', node, tensorMap, context)
as Tensor)];\n        }\n        case 'Less': {\n            return [tfOps.less(\n                getParamValue('a', node, tensorMap,
context) as Tensor,\n                getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        case
'LessEqual': {\n            return [tfOps.lessEqual(\n                getParamValue('a', node, tensorMap, context) as Tensor,\n
                getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        case 'LogicalAnd': {\n            return
[tfOps.logicalAnd(\n                getParamValue('a', node, tensorMap, context) as Tensor,\n                getParamValue('b',
node, tensorMap, context) as Tensor)];\n        }\n        case 'LogicalNot': {\n            return [tfOps.logicalNot(\n
                getParamValue('a', node, tensorMap, context) as Tensor)];\n        }\n        case 'LogicalOr': {\n            return
[tfOps.logicalOr(\n                getParamValue('a', node, tensorMap, context) as Tensor,\n                getParamValue('b',
node, tensorMap, context) as Tensor)];\n        }\n        case 'Select':\n        case 'SelectV2': {\n            return
[tfOps.where(\n                getParamValue('condition', node, tensorMap, context) as Tensor,\n                getParamValue('a', node, tensorMap, context) as Tensor,\n
                getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        default:\n            throw TypeError(`Node type ${node.op} is not implemented`);\n        }\n    };\n\nexport const CATEGORY = 'logical';\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

```

```

=====\n
*/\n\nimport {Tensor, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-
dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap}
from './../data/types';\nimport {ExecutionContext} from './../executor/execution_context';\nimport

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{InternalOpExecutor, Node} from './types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp:
InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[]
=> {\n switch (node.op) {\n case 'BatchMatMul':\n case 'BatchMatMulV2':\n case 'MatMul':\n return [tfOps.matMul(\n getParamValue('a', node, tensorMap, context) as Tensor2D,\n getParamValue('b', node, tensorMap, context) as Tensor2D,\n getParamValue('transposeA', node,
tensorMap, context) as boolean,\n getParamValue('transposeB', node, tensorMap, context) as\n
boolean)];\n\n case 'Transpose':\n return [tfOps.transpose(\n getParamValue('x', node, tensorMap,
context) as Tensor,\n getParamValue('perm', node, tensorMap, context) as number[])];\n\n case
'_FusedMatMul':\n const [extraOp, activationFunc] =\n (getParamValue('fusedOps', node, tensorMap,
context) as string[]);\n\n const isBiasAdd = extraOp === 'biasadd';\n const isPrelu = activationFunc ===
'prelu';\n\n const numArgs =\n (getParamValue('numArgs', node, tensorMap, context) as number);\n
const leakyreluAlpha =\n getParamValue('leakyreluAlpha', node, tensorMap, context) as\n
number;\n\n if (isBiasAdd) {\n if (isPrelu && numArgs !== 2) {\n throw new Error(\n
'Fused MatMul with BiasAdd and Prelu must have two ' +\n 'extra arguments: bias and alpha.);\n
}\n\n if (!isPrelu && numArgs !== 1) {\n throw new Error(\n
'Fused MatMul with BiasAdd
must have one extra argument: bias.);\n }\n }\n\n const [biasArg, preluArg] =\n
getParamValue('args', node, tensorMap, context) as Tensor[];\n return [tfOps.fused.matMul({\n a:
getParamValue('a', node, tensorMap, context) as Tensor2D,\n b: getParamValue('b', node, tensorMap,
context) as Tensor2D,\n transposeA: getParamValue('transposeA', node, tensorMap, context) as\n
boolean,\n transposeB: getParamValue('transposeB', node, tensorMap, context) as\n
boolean,\n bias: biasArg,\n activation: activationFunc as tfOps.fused.Activation,\n preluActivationWeights:
preluArg,\n leakyreluAlpha\n })];\n\n default:\n throw TypeError(`Node type ${node.op} is
not implemented`);\n }\n };\n\nexport const CATEGORY = 'matrices';\n\n"/**\n * @license\n * Copyright
2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *

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=====\n
*\n\nimport {Scalar, Tensor, Tensor3D, Tensor4D} from '@tensorflow/tfjs-core';\n\n// tslint:disable-next-line: no-
imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport
{NamedTensorsMap} from './../data/types';\nimport {ExecutionContext} from
'./../executor/execution_context';\nimport {InternalOpExecutor, Node} from './types';\nimport {getParamValue}
from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n
context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'FusedBatchNorm':\n case
'FusedBatchNormV2': {\n return [tfOps.batchNorm(\n getParamValue('x', node, tensorMap, context)
as Tensor,\n getParamValue('mean', node, tensorMap, context) as Tensor,\n
getParamValue('variance', node, tensorMap, context) as Tensor,\n getParamValue('offset', node, tensorMap,
context) as Tensor,\n getParamValue('scale', node, tensorMap, context) as Tensor,\n
getParamValue('epsilon', node, tensorMap, context) as number)];\n }\n\n case 'FusedBatchNormV3': {\n
return [tfOps.batchNorm(\n getParamValue('x', node, tensorMap, context) as Tensor,\n
getParamValue('mean', node, tensorMap, context) as Tensor,\n getParamValue('variance', node, tensorMap,
context) as Tensor,\n getParamValue('offset', node, tensorMap, context) as Tensor,\n
getParamValue('scale', node, tensorMap, context) as Tensor,\n getParamValue('epsilon', node, tensorMap,
context) as number)];\n }\n\n case 'LRN': {\n return [tfOps.localResponseNormalization(\n
getParamValue('x', node, tensorMap, context) as Tensor3D | Tensor4D,\n
getParamValue('radius', node, tensorMap, context) as number,\n getParamValue('bias', node, tensorMap,

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context) as number;\n      getParamValue('alpha', node, tensorMap, context) as number,\n      getParamValue('beta', node, tensorMap, context) as number)];\n    }\n    case 'Softmax': {\n      return\n      [tfOps.softmax(\n        getParamValue('x', node, tensorMap, context) as Tensor)];\n    }\n    case\n    'LogSoftmax': {\n      return [tfOps.logSoftmax(\n        getParamValue('x', node, tensorMap, context) as\n        Tensor)];\n    }\n    case 'SparseToDense': {\n      return [tfOps.sparseToDense(\n        getParamValue('sparseIndices', node, tensorMap, context) as\n        Tensor,\n        getParamValue('outputShape', node, tensorMap, context) as Tensor,\n        getParamValue('sparseValues', node,\n        tensorMap, context) as\n        number[],\n        getParamValue('defaultValue', node, tensorMap, context)\n        as\n        Scalar)];\n    }\n    default:\n      throw TypeError(`Node type ${node.op} is not\n      implemented`);\n    }\n  };\n  \n  export const CATEGORY = 'normalization';\n  \n  /**\n   * @license\n   * Copyright\n   * 2018 Google LLC. All Rights Reserved.\n   * Licensed under the Apache License, Version 2.0 (the \"License\");\n   * you may not use this file except in compliance with the License.\n   * You may obtain a copy of the License at\n   * http://www.apache.org/licenses/LICENSE-2.0\n   * Unless required by applicable law or agreed to in writing,\n   * software\n   * distributed under the License is distributed on an \"AS IS\" BASIS,\n   * WITHOUT WARRANTIES\n   * OR CONDITIONS OF ANY KIND, either express or implied.\n   * See the License for the specific language\n   * governing permissions and\n   * limitations under the License.\n   *\n   *=====\n   *\n   *import {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n   *// tslint:disable-next-line: no-imports-\n   *from-dist\n   *import * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n   *import\n   *{NamedTensorsMap} from '../data/types';\n   *import {ExecutionContext} from\n   *'../executor/execution_context';\n   *import {InternalOpExecutor, Node} from '../types';\n   *import {getParamValue}\n   *from './utils';\n   *\n   *export const executeOp: InternalOpExecutor =\n   *(node: Node, tensorMap: NamedTensorsMap,\n   *context: ExecutionContext): Tensor[] => {\n   *  switch (node.op) {\n   *    case 'Max': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.max(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'Mean': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims\n   *      =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.mean(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'Min': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.min(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'Sum': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.sum(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'All': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.all(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'Any': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return [tfOps.any(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *    case 'ArgMax':\n   *    {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number;\n   *      return\n   *      [tfOps.argmax(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n   *    }\n   *    case\n   *    'ArgMin': {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number;\n   *      return\n   *      [tfOps.argmin(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n   *    }\n   *    case 'Prod':\n   *    {\n   *      const axis =\n   *      getParamValue('axis', node, tensorMap, context) as number[];\n   *      const\n   *      keepDims =\n   *      getParamValue('keepDims', node, tensorMap, context) as boolean;\n   *      return\n   *      [tfOps.prod(\n   *      getParamValue('x', node, tensorMap, context) as Tensor, axis,\n   *      keepDims)];\n   *    }\n   *  }\n   *}\n   *

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}\n    case 'Cumsum': {\n        const axis =\n            getParamValue('axis', node, tensorMap, context) as
number;\n        const exclusive =\n            getParamValue('exclusive', node, tensorMap, context) as boolean;\n
        const reverse =\n            getParamValue('reverse', node, tensorMap, context) as boolean;\n        return
[tfOps.cumsum(\n            getParamValue('x', node, tensorMap, context) as Tensor, axis,\n            exclusive,
reverse)];\n    }\n    case 'Bincount':\n        const x = getParamValue('x', node, tensorMap, context) as
Tensor1D;\n        const weights =\n            getParamValue('weights', node, tensorMap, context) as Tensor1D;\n
        const size =\n            getParamValue('size', node, tensorMap, context) as number;\n        return
[tfOps.bincount(x, weights, size)];\n    case 'DenseBincount': {\n        const x = getParamValue('x', node,
tensorMap, context) as Tensor1D |\n            Tensor2D;\n        const weights =\n            getParamValue('weights',
node, tensorMap, context) as Tensor1D |\n            Tensor2D;\n        const size =\n            getParamValue('size',
node, tensorMap, context) as number;\n        const binaryOutput =\n            getParamValue('binaryOutput',
node, tensorMap, context) as\n            boolean;\n        return [tfOps.denseBincount(x, weights, size,
binaryOutput)];\n    }\n    default:\n        throw TypeError(`Node type ${node.op} is not implemented`);\n
}\n };;\n\nexport const CATEGORY = 'reduction';\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*\n\nimport {Scalar, Tensor, Tensor1D, tidy, util} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-
imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport
{NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from
'../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\nimport {getParamValue}
from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n
context: ExecutionContext): Tensor[] => {\n    switch (node.op) {\n        case 'ConcatV2':\n            case 'Concat': {\n
                const n = getParamValue('n', node, tensorMap, context) as number;\n                const axis =\n                    getParamValue('axis', node, tensorMap, context) as number;\n                let inputs =\n                    getParamValue('tensors',
node, tensorMap, context) as Tensor[];\n                inputs = inputs.slice(0, n);\n                return [tfOps.concat(inputs,
axis)];\n            }\n            case 'Gather': {\n                const input = getParamValue('x', node, tensorMap, context) as
Tensor;\n                const indices =\n                    getParamValue('indices', node, tensorMap, context) as Tensor1D;\n                return [tfOps.gather(input, tfOps.cast(indices, 'int32'), 0)];\n            }\n            case 'GatherV2': {\n                const axis =\n                    getParamValue('axis', node, tensorMap, context) as number;\n                const batchDims =\n                    getParamValue('batchDims', node, tensorMap, context) as number;\n                const input = getParamValue('x', node,
tensorMap, context) as Tensor;\n                const indices =\n                    getParamValue('indices', node, tensorMap, context)
as Tensor1D;\n                return [tfOps.gather(\n                    input, tfOps.cast(indices, 'int32'), axis, batchDims)];\n            }\n            case 'Reverse': {\n                const dims =\n                    getParamValue('dims', node, tensorMap, context) as boolean[];\n                const axis = [];\n                for (let i = 0; i < dims.length; i++) {\n                    if (dims[i]) {\n                        axis.push(i);\n                    }\n                }\n                const input = getParamValue('x', node, tensorMap, context) as Tensor;\n                return
[tfOps.reverse(input, axis)];\n            }\n            case 'ReverseV2': {\n                const axis =\n                    getParamValue('axis',
node, tensorMap, context) as number[];\n                const input = getParamValue('x', node, tensorMap, context) as
Tensor;\n                return [tfOps.reverse(input, axis)];\n            }\n            case 'Slice': {\n                // tslint:disable-next-line:no-
any\n                const begin = getParamValue('begin', node, tensorMap, context) as any;\n                // tslint:disable-next-
line:no-any\n                const size = getParamValue('size', node, tensorMap, context) as any;\n                return
[tfOps.slice(\n                    getParamValue('x', node, tensorMap, context) as Tensor, begin,\n                    size)];\n            }\n            case 'StridedSlice': {\n                const begin =\n                    getParamValue('begin', node, tensorMap, context) as
number[];\n                const end =\n                    getParamValue('end', node, tensorMap, context) as number[];\n                const

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(node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext):\n    Tensor[] => {\n        switch
(node.op) {\n            case 'FFT': {\n                return [tfOps.fft(\n                    getParamValue('x', node, tensorMap,
context) as Tensor)];\n            }\n            case 'IFFT': {\n                return [tfOps.iff(\n                    getParamValue('x',
node, tensorMap, context) as Tensor)];\n            }\n            case 'RFFT': {\n                return [tfOps.rfft(\n
getParamValue('x', node, tensorMap, context) as Tensor)];\n            }\n            case 'IRFFT': {\n                return
[tfOps.irfft(\n                    getParamValue('x', node, tensorMap, context) as Tensor)];\n            }\n            default:\n                throw TypeError('Node type ${node.op} is not implemented');\n            }\n        };\n    }\n\nexport const CATEGORY
= 'spectral';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * \n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=====
*\n\nimport {Tensor, Tensor4D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-
dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\nimport {NamedTensorsMap}
from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport
{InternalOpExecutor, Node} from './types';\nimport {getParamValue} from './utils';\n\nexport const executeOp:
InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[]
=> {\n    switch (node.op) {\n        case 'Cast': {\n            return [tfOps.cast(\n                getParamValue('x', node,
tensorMap, context) as Tensor,\n                getParamValue('dtype', node, tensorMap, context) as 'int32' | \n
'float32' | 'bool')];\n        }\n        case 'ExpandDims': {\n            const axis =\n                getParamValue('axis', node,
tensorMap, context) as number;\n            return [tfOps.expandDims(\n                getParamValue('x', node, tensorMap,
context) as Tensor, axis)];\n        }\n        case 'Squeeze': {\n            const axis =\n                getParamValue('axis', node,
tensorMap, context) as number[];\n            return [tfOps.squeeze(\n                getParamValue('x', node, tensorMap,
context) as Tensor, axis)];\n        }\n        case 'Reshape': {\n            return [tfOps.reshape(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n                getParamValue('shape', node, tensorMap,
context) as number[])];\n        }\n        case 'MirrorPad': {\n            return [tfOps.mirrorPad(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n                getParamValue('padding', node, tensorMap,
context) as\n                Array<[number, number]>,\n                getParamValue('mode', node, tensorMap, context) as
'reflect' | \n
'symmetric')];\n        }\n        case 'PadV2':\n        case 'Pad': {\n            return [tfOps.pad(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n                getParamValue('padding', node, tensorMap,
context) as\n                Array<[number, number]>,\n                getParamValue('constantValue', node, tensorMap,
context) as\n                number)];\n        }\n        case 'SpaceToBatchND': {\n            const blockSize =\n                getParamValue('blockShape', node, tensorMap, context) as number[];\n            const paddings =\n                getParamValue('paddings', node, tensorMap, context) as number[][];\n            return [tfOps.spaceToBatchND(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n                blockSize, paddings)];\n        }\n        case
'BatchToSpaceND': {\n            const blockSize =\n                getParamValue('blockShape', node, tensorMap, context)
as number[];\n            const crops =\n                getParamValue('crops', node, tensorMap, context) as number[][];\n            return [tfOps.batchToSpaceND(\n
getParamValue('x', node, tensorMap, context) as Tensor,\n                blockSize, crops)];\n        }\n        case 'DepthToSpace': {\n            const blockSize =\n                getParamValue('blockSize', node, tensorMap, context) as number;\n            const dataFormat =\n                (getParamValue('dataFormat', node, tensorMap, context) as\n                string).toUpperCase() as 'NHWC' | \n
'NCHW';\n            return [tfOps.depthToSpace(\n                getParamValue('x', node, tensorMap, context) as
Tensor4D,\n                blockSize, dataFormat)];\n        }\n        case 'BroadcastTo': {\n            return
[tfOps.broadcastTo(\n                getParamValue('x', node, tensorMap, context) as Tensor,\n                getParamValue('shape', node, tensorMap, context) as number[])];\n        }\n        default:\n            throw

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TypeError(`Node type ${node.op} is not implemented`);\n    }\n  };\n\nexport const CATEGORY =
'transformation';\n", "/*\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *

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=====
*\n\nimport * as tfc from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../data/types';\nimport
{ExecutionContext} from '../executor/execution_context';\nimport {ResourceManager} from
 '../executor/resource_manager';\n\nimport {NodeValueImpl} from '../custom_op/node_value_impl';\nimport
{getRegisteredOp} from '../custom_op/register';\nimport * as arithmetic from
 '../executors/arithmetic_executor';\nimport * as basicMath from '../executors/basic_math_executor';\nimport * as
control from '../executors/control_executor';\nimport * as convolution from
 '../executors/convolution_executor';\nimport * as creation from '../executors/creation_executor';\nimport * as
dynamic from '../executors/dynamic_executor';\nimport * as evaluation from '../executors/evaluation_executor';\nimport *
as graph from '../executors/graph_executor';\nimport * as hashTable from '../executors/hash_table_executor';\nimport *
as image from '../executors/image_executor';\nimport * as logical from '../executors/logical_executor';\nimport * as
matrices from '../executors/matrices_executor';\nimport * as normalization from
 '../executors/normalization_executor';\nimport * as reduction from '../executors/reduction_executor';\nimport * as
sliceJoin from '../executors/slice_join_executor';\nimport * as spectral from '../executors/spectral_executor';\nimport *
as transformation from '../executors/transformation_executor';\nimport {Node} from './types';\n\n/**\n * Executes the
op defined by the node object.\n * @param node\n * @param tensorMap contains tensors for executed nodes and
weights\n * @param context contains tensors and information for running the current node.\n * @param
resourceManager Optional. Contains global resources of the model.\n */\nexport function executeOp(\n  node:
Node, tensorMap: NamedTensorsMap, context: ExecutionContext,\n  resourceManager?: ResourceManager):
tfc.Tensor[]\n  Promise<tfc.Tensor[]> {\n  const value = (\n    ((node: Node, tensorMap: NamedTensorsMap, context:
ExecutionContext) => {\n      switch (node.category) {\n        case 'arithmetic':\n          return tfc.tidy(\n
            () => arithmetic.executeOp(node, tensorMap, context));\n        case 'basic_math':\n          return
tfc.tidy(\n            () => basicMath.executeOp(node, tensorMap, context));\n        case 'control':\n          return
control.executeOp(node, tensorMap, context);\n        case 'convolution':\n          return tfc.tidy(\n            () =>
convolution.executeOp(node, tensorMap, context));\n        case 'creation':\n          return tfc.tidy(() =>
creation.executeOp(node, tensorMap, context));\n        case 'dynamic':\n          return dynamic.executeOp(node,
tensorMap, context);\n        case 'evaluation':\n          return tfc.tidy(\n            () => evaluation.executeOp(node,
tensorMap, context));\n        case 'image':\n          return tfc.tidy(() => image.executeOp(node, tensorMap,
context));\n        case 'graph':\n          return tfc.tidy(() => graph.executeOp(node, tensorMap, context));\n
        case 'logical':\n          return tfc.tidy(() => logical.executeOp(node, tensorMap, context));\n        case
'matrices':\n          return tfc.tidy(() => matrices.executeOp(node, tensorMap, context));\n        case
'normalization':\n          return tfc.tidy(\n            () => normalization.executeOp(node, tensorMap, context));\n
        case 'reduction':\n          return tfc.tidy(\n            () => reduction.executeOp(node, tensorMap, context));\n
        case 'slice_join':\n          return tfc.tidy(\n            () => sliceJoin.executeOp(node, tensorMap, context));\n
        case 'spectral':\n          return tfc.tidy(() => spectral.executeOp(node, tensorMap, context));\n        case
'transformation':\n          return tfc.tidy(\n            () => transformation.executeOp(node, tensorMap, context));\n
        case 'hash_table':\n          return hashTable.executeOp(\n            node, tensorMap, context, resourceManager);\n
        case 'custom':\n          const opMapper = getRegisteredOp(node.op);\n          if (opMapper && opMapper.customExecutor) {\n
            return opMapper.customExecutor(\n              new NodeValueImpl(node, tensorMap, context);\n            )\n          } else {\n
            throw TypeError(`Custom op ${node.op} is not registered.`);\n          }\n          default:\n            throw

```

```

TypeError(\n      `Unknown op '${node.op}'. File an issue at ` +\n
`https://github.com/tensorflow/tfjs/issues so we can add it` +\n      ``, or register a custom execution with
tf.registerOp(`);\n    }(\n    })(node, tensorMap, context);\n    if (tfc.util.isPromise(value)) {\n    return (value as
Promise<tfc.Tensor>).then((data) => [].concat(data));\n    }\n    return [].concat(value);\n  }\n  }", "/*\n * @license\n *
Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
`License`);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an `AS IS` BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n */
=====
*\nimport {Tensor} from '@tensorflow/tfjs-core';\nimport {NamedTensorsMap, TensorArrayMap,
TensorListMap} from './data/types';\nimport {TensorArray} from './tensor_array';\nimport {TensorList} from
 './tensor_list';\nimport {FunctionExecutor} from './types';\n\nexport interface ExecutionContextInfo {\n  id: number;
  // the unique id of the context info\n  frameName: string; // The frame name of the loop, this comes from\n
  // the TensorFlow NodeDef.\n  iterationId: number; // The iteration id of the loop\n}\n\n/*\n *
ExecutionContext captures the runtime environment of the node. It keeps\n * track of the current frame and iteration
for the control flow ops.\n * For example, typical Dynamic RNN model may contain loops, for which\n *
TensorFlow will generate graphs with Enter/Exit nodes to control the\n * current execution frame, and NextIteration
Nodes for iteration id increment.\n * For model with branch logic, TensorFlow will generate Switch/Merge ops.\n
*\nexport class ExecutionContext {\n  private rootContext = {id: 0, frameName: "", iterationId: 0};\n  private
contexts: ExecutionContextInfo[] = [this.rootContext];\n  private lastId = 0;\n  private _currentContextIds:
string[];\n\n  constructor(\n    readonly weightMap: NamedTensorsMap = {},\n    readonly tensorArrayMap:
TensorArrayMap = {},\n    readonly tensorListMap: TensorListMap = {},\n    readonly functionMap: {[key:
string]: FunctionExecutor} = {}) {\n    this.generateCurrentContextIds();\n  }\n\n  private newFrame(id: number,
frameName: string) {\n    return {id, frameName, iterationId: 0};\n  }\n\n  /*\n * Set the current context\n *
@param contexts: ExecutionContextInfo[] the current path of execution\n * frames\n * \n set
currentContext(contexts: ExecutionContextInfo[]) {\n    if (this.contexts !== contexts) {\n      this.contexts =
contexts;\n      this.generateCurrentContextIds();\n    }\n  }\n\n  get currentContext(): ExecutionContextInfo[] {\n
return this.contexts;\n  }\n\n  /*\n * Returns the current context in string format.\n * \n get currentContextId():
string {\n    return this._currentContextIds[0];\n  }\n\n  /*\n * Returns the current context and all parent contexts
in string format.\n * This allow access to the nodes in the current and parent frames.\n * \n get
currentContextIds(): string[] {\n    return this._currentContextIds;\n  }\n\n  private generateCurrentContextIds() {\n
const names = [];\n    for (let i = 0; i < this.contexts.length - 1; i++) {\n      const contexts =
this.contexts.slice(0,
this.contexts.length - i);\n      names.push(this.contextIdforContexts(contexts));\n    }\n    names.push("");\n
this._currentContextIds = names;\n  }\n\n  private contextIdforContexts(contexts: ExecutionContextInfo[]) {\n
return contexts ?\n    contexts\n      .map(\n        context => (context.id === 0 && context.iterationId ===
0) ?\n          "" :\n          `${context.frameName}-${context.iterationId}`)\n      .join("/") :\n    "";\n  }\n\n  /*\n * Enter a new frame, a new context is pushed on the current context list.\n *
@param frameId new
frame id\n * \n enterFrame(frameId: string) {\n    if (this.contexts) {\n      this.lastId++;\n      this.contexts =
this.contexts.slice();\n      this.contexts.push(this.newFrame(this.lastId, frameId));\n
this._currentContextIds.unshift(this.contextIdforContexts(this.contexts));\n    }\n  }\n\n  /*\n * Exit the current
frame, the last context is removed from the current\n * context list.\n * \n exitFrame() {\n    if (this.contexts &&
this.contexts.length > 1) {\n      this.contexts = this.contexts.slice();\n      this.contexts.splice(-1);\n
this.currentContextIds.shift();\n    } else {\n      throw new Error('Cannot exit frame, the context is empty');\n    }\n  }\n\n  /*\n * Enter the next iteration of a loop, the iteration id of last context is\n *
increased.\n * \n
nextIteration() {\n    if (this.contexts && this.contexts.length > 0) {\n      this.contexts =
this.contexts.slice();\n      this.lastId++;\n      const context =\n        Object.assign({}, this.contexts[this.contexts.length - 1]);\n
}

```

```

context.iterationId += 1;\n    context.id = this.lastId;\n    this.contexts.splice(-1, 1, context);\n    this._currentContextIds.splice(\n        0, 1, this.contextIdforContexts(this.contexts));\n    } else {\n        throw new\n        Error('Cannot increase frame iteration, the context is empty');\n    }\n    }\n    getWeight(name: string): Tensor[] {\n    return this.weightMap[name];\n    }\n    addTensorArray(tensorArray: TensorArray) {\n    this.tensorArrayMap[tensorArray.id] = tensorArray;\n    }\n    getTensorArray(id: number): TensorArray {\n    return\n    this.tensorArrayMap[id];\n    }\n    addTensorList(tensorList: TensorList) {\n    this.tensorListMap[tensorList.id] =\n    tensorList;\n    }\n    getTensorList(id: number): TensorList {\n    return this.tensorListMap[id];\n    }\n    dispose(keepIds: Set<number>) {\n    for (const key in this.tensorArrayMap) {\n    this.tensorArrayMap[key].clearAndClose(keepIds);\n    }\n    for (const key in this.tensorListMap) {\n    this.tensorListMap[key].clearAndClose(keepIds);\n    }\n    }\n    }"/**\n    * @license\n    * Copyright 2019 Google\n    LLC. All Rights Reserved.\n    * Licensed under the Apache License, Version 2.0 (the \"License\");\n    * you may not\n    use this file except in compliance with the License.\n    * You may obtain a copy of the License at\n    *\n    * http://www.apache.org/licenses/LICENSE-2.0\n    *\n    * Unless required by applicable law or agreed to in writing,\n    software\n    * distributed under the License is distributed on an \"AS IS\" BASIS,\n    * WITHOUT WARRANTIES\n    OR CONDITIONS OF ANY KIND, either express or implied.\n    * See the License for the specific language\n    governing permissions and\n    * limitations under the License.\n    */\n    =====\n    *\n    import {NamedTensorMap} from '@tensorflow/tfjs-core';\n    import {NamedTensorsMap} from\n    './data/types';\n    import {parseNodeName} from './operations/executors/utils';\n    import {Graph, Node} from\n    './operations/types';\n    export interface ExecutionInfo {\n    inputs: NamedTensorMap;\n    outputs: Node[];\n    usedNodes: Set<string>;\n    missingInputs: string[];\n    dynamicNode: Node;\n    syncInputs: string[];\n    }\n    /**\n    * Given graph inputs and desired outputs, find the minimal set of nodes\n    * to execute in order to compute the outputs.\n    In addition return other useful\n    * info such:\n    * - Missing inputs needed to compute the output.\n    * - Whether the\n    subgraph contains dynamic ops (control flow, dynamic shape).\n    * - Alternative inputs in order to avoid async\n    (dynamic op) execution.\n    */\n    export function getExecutionSubgraph(\n    inputs: NamedTensorMap, outputs:\n    Node[], weightMap: NamedTensorsMap,\n    initNodes?: Node[]): ExecutionInfo {\n    const usedNodes = new\n    Set<string>();\n    const missingInputs: string[] = [];\n    let dynamicNode: Node = null;\n    let syncInputs: string[] =\n    null;\n    // Start with the outputs, going backwards and find all the nodes that are\n    // needed to compute those\n    outputs.\n    const seen = new Set<string>();\n    const inputNodeNames =\n    Object.keys(inputs).map(name =>\n    parseNodeName(name)[0]);\n    let initNodeNames: string[] = [];\n    if (initNodes != null) {\n    initNodeNames =\n    initNodes.map(node => parseNodeName(node.name)[0]);\n    }\n    const frontier = [...outputs];\n    while\n    (frontier.length > 0) {\n    const node = frontier.pop();\n    if (isControlFlow(node) || isDynamicShape(node) ||\n    isHashTable(node)) {\n    if (dynamicNode == null) {\n    dynamicNode = node;\n    syncInputs =\n    dynamicNode.children.map(child => child.name)\n    .filter(name => usedNodes.has(name));\n    }\n    }\n    usedNodes.add(node.name);\n    // Weights are dead end since we already have their values.\n    if\n    (weightMap[node.name] != null) {\n    continue;\n    }\n    // This node is a dead end since it's one of the user-\n    provided inputs.\n    if (inputNodeNames.indexOf(node.name) !== -1) {\n    continue;\n    }\n    // This node is a\n    dead end since it doesn't have any inputs.\n    if (initNodeNames.indexOf(node.name) !== -1) {\n    continue;\n    }\n    if (node.inputs.length === 0) {\n    missingInputs.push(node.name);\n    continue;\n    }\n    node.inputs.forEach(input => {\n    // Don't add to the frontier if it is already there.\n    if (seen.has(input.name))\n    {\n    return;\n    }\n    seen.add(input.name);\n    frontier.push(input);\n    });\n    }\n    return {inputs, outputs,\n    usedNodes, missingInputs, dynamicNode, syncInputs};\n    }\n    /**\n    * Given the execution info, return a list of nodes\n    in topological order that\n    * need to be executed to compute the output.\n    */\n    export function\n    getNodesInTopologicalOrder(\n    graph: Graph, weightMap: NamedTensorsMap,\n    executionInfo:\n    ExecutionInfo): Node[] {\n    const {usedNodes, inputs} = executionInfo;\n    const frontier: Node[] = [];\n    const\n    inputNodes = Object.keys(inputs)\n    .map(name => parseNodeName(name)[0])\n    .map(name => graph.nodes[name]);\n    const initNodes = graph.initNodes;\n    inputNodes.forEach(input => {\n    if\n    (usedNodes.has(input.name)) {\n    frontier.push(input);\n    }\n    });\n    graph.weights.forEach(weight => {\n    if

```



```

(usedNodes.has(weight.name)) {\n  frontier.push(weight);\n  }\n });\n if (initNodes != null) {\n
initNodes.forEach(node => {\n  if (usedNodes.has(node.name)) {\n  frontier.push(node);\n  }\n });\n }\n
const seen = new Set<string>();\n const orderedNodes: Node[] = [];\n while (frontier.length > 0) {\n  const node =
frontier.pop();\n  seen.add(node.name);\n  if (!weightMap[node.name]) {\n  orderedNodes.push(node);\n  }\n
node.children.forEach(child => {\n  if (!seen.has(child.name) && usedNodes.has(child.name) &&\n
child.inputs.every(input => seen.has(input.name))) {\n  frontier.push(child);\n  }\n });\n }\n return
orderedNodes;\n}\n\nconst CONTROL_FLOW_OPS = [\n 'Switch', 'Merge', 'Enter', 'Exit', 'NextIteration',
'StatelessIf',\n 'StatelessWhile', 'if', 'While'\n];\nconst DYNAMIC_SHAPE_OPS = [\n 'NonMaxSuppressionV2',
'NonMaxSuppressionV3', 'NonMaxSuppressionV5', 'Where'\n];\nconst HASH_TABLE_OPS = [\n 'HashTable',
'HashTableV2', 'LookupTableImport', 'LookupTableImportV2',\n 'LookupTableFind',
'LookupTableFindV2'\n];\n\nexport function isControlFlow(node: Node) {\n return
CONTROL_FLOW_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isDynamicShape(node: Node) {\n return
DYNAMIC_SHAPE_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isHashTable(node: Node) {\n return
HASH_TABLE_OPS.indexOf(node.op) >= 0;\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
*/\n\nimport {DataType, NamedTensorMap, Tensor, tidy, util} from '@tensorflow/tfjs-core';\n\nimport
{ISignatureDef} from '../data/compiled_api';\n\nimport {NamedTensorsMap, TensorArrayMap, TensorInfo,
TensorListMap} from '../data/types';\n\nimport {getNodeNameAndIndex, getParamValue, getTensor,
getTensorsForCurrentContext, parseNodeName} from '../operations/executors/utis';\n\nimport {executeOp} from
 '../operations/operation_executor';\n\nimport {Graph, Node} from '../operations/types';\n\nimport {ExecutionContext,
ExecutionContextInfo} from './execution_context';\n\nimport {getExecutionSubgraph, getNodesInTopologicalOrder,
isControlFlow} from './model_analysis';\n\nimport {ResourceManager} from './resource_manager';\n\nimport
{FunctionExecutor} from './types';\n\ninterface NodeWithContexts {\n  contexts: ExecutionContextInfo[];\n  node:
Node;\n}\n\nexport class GraphExecutor implements FunctionExecutor {\n  private compiledMap: Map<string,
Node[]> = new Map();\n  private _weightMap: NamedTensorsMap = {};\n  private _weightIds: number[];\n  private
_signature: ISignatureDef;\n  private _inputs: Node[];\n  private _outputs: Node[];\n  private _initNodes: Node[]; //
Internal init nodes to start initialization.\n  private SEPERATOR = ',';\n  private _functions: {[key: string]: Graph} =
{};\n  private _functionExecutorMap: {[key: string]: FunctionExecutor} = {};\n  private _resourceManager:
ResourceManager;\n\n  get weightIds(): number[] {\n  return this.parent ? this.parent.weightIds : this._weightIds;\n
}\n\n  get functionExecutorMap(): {[key: string]: FunctionExecutor} {\n  return this.parent ?
this.parent.functionExecutorMap :\n  this._functionExecutorMap;\n }\n\n  get weightMap():
NamedTensorsMap {\n  return this.parent ? this.parent.weightMap : this._weightMap;\n }\n\n  set
weightMap(weightMap: NamedTensorsMap) {\n  const weightIds = Object.keys(weightMap).map(\n  key =>
weightMap[key].map(tensor => tensor.id));\n  this._weightIds = [].concat(...weightIds);\n  this._weightMap =
weightMap;\n }\n\n  /**\n  * Set `ResourceManager` shared by executors of a model.\n  * @param
resourceManager: `ResourceManager` of the `GraphModel`.\n  */\n  set resourceManager(resourceManager:
ResourceManager) {\n  this._resourceManager = resourceManager;\n }\n\n  get inputs(): TensorInfo[] {\n  return
this._inputs.map(node => {\n  return {\n  name: node.name,\n  shape: node.attrParams['shape'] ?\n
node.attrParams['shape'].value as number[] :\n  undefined,\n  dtype: node.attrParams['dtype'] ?\n
node.attrParams['dtype'].value as DataType :\n  undefined\n  };\n });\n }\n\n  get outputs(): TensorInfo[]
{\n  return this._outputs.map(node => {\n  return {\n  name: node.name,\n  shape:
node.attrParams['shape'] ?\n  node.attrParams['shape'].value as number[] :\n  undefined,\n  dtype:

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node.attrParams['dtype'] ?\n      node.attrParams['dtype'].value as DataType :\n      undefined\n    });\n  });\n  }\n  get inputNodes(): string[] {\n    return this._inputs.map(node => node.signatureKey || node.name);\n  }\n  get outputNodes(): string[] {\n    return this._outputs.map((node) => {\n      const name = node.signatureKey ||\n        node.name;\n      return node.defaultOutput ? (`${name}:${node.defaultOutput}`) : name;\n    });\n  }\n  get\n  functions(): {[key: string]: ISignatureDef} {\n    return Object.keys(this._functions).reduce((map, key) => {\n      map[key] = this._functions[key].signature;\n      return map;\n    }, {}) as {[key: string]: ISignatureDef};\n  }\n  /**\n   * @param graph Graph the model or function graph to be executed.\n   * @param parent When building\n   function executor you need to set the parent\n   * executor. Since the weights and function executor maps are set at\n   parant\n   * level, that function executor can access the function maps and weight maps\n   * through the parent.\n   */\n  constructor(private graph: Graph, private parent?: GraphExecutor) {\n    this._outputs = graph.outputs;\n    this._inputs = graph.inputs;\n    this._initNodes = graph.initNodes;\n    this._signature = graph.signature;\n    this._functions = graph.functions;\n    // create sub-graph executors\n    if (graph.functions != null) {\n      Object.keys(graph.functions).forEach(name => {\n        this._functionExecutorMap[name] =\n          new\n          GraphExecutor(graph.functions[name], this);\n      });\n    }\n  }\n  private getCompilationKey(inputs: Node[],\n    outputs: Node[]): string {\n    const sortedInputs = inputs.map(node => node.name).sort();\n    const sortedOutputs =\n      outputs.map(node => node.name).sort();\n    return sortedInputs.join(this.SEPERATOR) + '--' +\n      sortedOutputs.join(this.SEPERATOR);\n  }\n  /**\n   * Compiles the inference graph and returns the minimal set\n   of nodes that are\n   * required for execution, in the correct execution order.\n   */\n  private compile(inputs:\n    NamedTensorMap, outputs: Node[]): Node[] {\n    const executionInfo =\n      getExecutionSubgraph(inputs,\n      outputs, this.weightMap, this._initNodes);\n    const {missingInputs, dynamicNode, syncInputs} = executionInfo;\n    if (dynamicNode != null) {\n      throw new Error(\n        `This execution contains the node\n        '${dynamicNode.name}', which has\n        `the dynamic op '${dynamicNode.op}'. Please use\n        `+\n        `model.executeAsync() instead. Alternatively, to avoid the\n        `dynamic ops, specify the inputs\n        [${syncInputs}]);\n    }\n    if (missingInputs.length > 0) {\n      const outNames = outputs.map(n => n.name);\n      const inNames = Object.keys(inputs);\n      throw new Error(\n        `Cannot compute the outputs [${outNames}]\n        from the provided inputs\n        `+[inNames]]. Missing the following inputs: [${missingInputs}]);\n    }\n    return getNodesInTopologicalOrder(\n      this.graph, this.weightMap, executionInfo);\n  }\n  /**\n   * Executes\n   the inference for given input tensors.\n   * @param inputs Tensor map for the model inputs, keyed by the input\n   node\n   * names.\n   * @param outputs Optional. output node name from the Tensorflow model, if\n   * no outputs\n   are specified, the default outputs of the model would be used.\n   * You can inspect intermediate nodes of the model\n   by adding them to the\n   * outputs array.\n   */\n  execute(inputs: NamedTensorMap, outputs?: string[]): Tensor[]\n  {\n    inputs = this.mapInputs(inputs);\n    const names = Object.keys(inputs).sort();\n    this.checkInputs(inputs);\n    this.checkInputShapeAndType(inputs);\n    outputs = this.mapOutputs(outputs);\n    this.checkOutputs(outputs);\n    const inputNodes =\n      names.map(name => this.graph.nodes[parseNodeName(name)[0]]);\n    const\n    outputNodeNames = outputs.map(name => parseNodeName(name)[0]);\n    let outputNodes =\n      outputNodeNames.map(name => this.graph.nodes[name]);\n    // If no outputs are specified, then use the default\n    outputs of the model.\n    if (outputNodes.length === 0) {\n      outputNodes = this._outputs;\n    }\n    const\n    compilationKey = this.getCompilationKey(inputNodes, outputNodes);\n    // Do nothing if the compiled graph\n    cache contains the input.\n    let orderedNodes = this.compiledMap.get(compilationKey);\n    if (orderedNodes ==\n      null) {\n      orderedNodes = this.compile(inputs, outputNodes);\n      this.compiledMap.set(compilationKey,\n        orderedNodes);\n    }\n    const tensorArrayMap: TensorArrayMap = {};\n    const tensorListMap: TensorListMap\n    = {};\n    return tidy(() => {\n      const context = new ExecutionContext(\n        this.weightMap,\n        tensorArrayMap, tensorListMap,\n        this.functionExecutorMap);\n      const tensorsMap: NamedTensorsMap =\n        {...this.weightMap};\n      Object.keys(inputs).forEach(name => {\n        const [nodeName, index] =\n          parseNodeName(name);\n        const tensors: Tensor[] = [];\n        tensors[index] = inputs[name];\n        tensorsMap[nodeName] = tensors;\n      });\n      const tensorsToKeep = this.getFrozenTensorIds(tensorsMap);\n      const intermediateTensorConsumerCount: {[key: number]: number} = {};\n      for (let i = 0; i <\n        orderedNodes.length; i++) {\n        const node = orderedNodes[i];\n        if (!tensorsMap[node.name]) {\n          const

```

```

tensors =\n
    executeOp(node, tensorsMap, context, this._resourceManager) as\n
        Tensor[];\n
    if
(UTIL.isPromise(tensors)) {\n
    throw new Error(\n
        `The execution of the op '${node.op}' returned a
promise. ` +\n
        `Please use model.executeAsync() instead.`);\n
    }\n
    tensorsMap[node.name] =
tensors;\n
    this.checkTensorForDisposal(\n
        node.name, node, tensorsMap, context, tensorsToKeep,\n
        outputNodeNames, intermediateTensorConsumerCount);\n
    }\n
    }\n
    // dispose the context for the root
executor\n
    if (this.parent == null) {\n
        context.dispose(tensorsToKeep);\n
    }\n
    return outputs.map(name
=> getTensor(name, tensorsMap, context));\n
    });\n
    }\n
    private getFrozenTensorIds(tensorMap:
NamedTensorMap): Set<number> {\n
    const ids = [].concat.apply(\n
        [],\n
        Object.keys(tensorMap)\n
        .map(key => tensorMap[key])\n
        .map(tensors => tensors.map(tensor => tensor.id));\n
    return new
Set(ids);\n
    }\n
    private checkTensorForDisposal(\n
        nodeName: string, node: Node, tensorMap:
NamedTensorMap,\n
        context: ExecutionContext, tensorsToKeep: Set<number>,\n
        outputNames: string[],\n
        intermediateTensorConsumerCount: {[key: string]: number}) {\n
    // Skip output nodes and any control flow
nodes, since its dependency is\n
    // tricky to track correctly.\n
    if (node.category === 'control' ||
outputNames.indexOf(nodeName) !== -1) {\n
    return;\n
    }\n
    tensorMap[nodeName].forEach(tensor => {\n
    if (tensor != null) {\n
        intermediateTensorConsumerCount[tensor.id] =\n
(intermediateTensorConsumerCount[tensor.id] || 0) +\n
        node.children.length;\n
    }\n
    });\n
    node.inputs.forEach(input => {\n
    // Skip any control flow nodes, since its dependency is tricky to track\n
    //
correctly.\n
    if (input.category !== 'control') {\n
        const tensors =\n
getTensorsForCurrentContext(input.name, tensorMap, context);\n
        if (tensors != null) {\n
            tensors.forEach(tensor => {\n
                if (tensor && !tensorsToKeep.has(tensor.id)) {\n
                    const count =
intermediateTensorConsumerCount[tensor.id];\n
                    if (count === 1) {\n
                        tensor.dispose();\n
                        delete intermediateTensorConsumerCount[tensor.id];\n
                    } else if (count != null) {\n
                        // only
intermediate nodes has count set, inputs and weights are\n
                        // not.\n
                        intermediateTensorConsumerCount[tensor.id]--;\n
                    }\n
                });\n
            });\n
        });\n
    });\n
    }\n
    }\n
    }\n
    }\n
    }\n
    /**\n
    * Executes the inference for given input tensors in Async fashion.\n
    * @param inputs Tensor map for the
model inputs, keyed by the input node\n
    * names.\n
    * @param outputs output node name from the Tensorflow
model, if no outputs\n
    * are specified, the default outputs of the model would be used. You can\n
    * inspect
intermediate nodes of the model by adding them to the outputs\n
    * array.\n
    */\n
    async executeAsync(inputs:
NamedTensorMap, outputs?: string[]):\n
    Promise<Tensor[]> {\n
    return this._executeAsync(inputs, outputs);\n
    }\n
    }\n
    /**\n
    * Executes the inference for given input tensors in Async fashion.\n
    * @param inputs Tensor map for
the model inputs, keyed by the input node\n
    * names.\n
    * @param outputs Optional. output node name from the
Tensorflow model,\n
    * if no outputs are specified, the default outputs of the model would be\n
    * used. You can
inspect intermediate nodes of the model by adding them to the\n
    * outputs array.\n
    * @param
isFunctionExecution Optional. Flag for executing a function.\n
    * @param tensorArrayMap Optional, global
TensorArray map by id. Used for\n
    * function execution.\n
    * @param tensorListMap Optinal global TensorList
map by id. Used for\n
    * function execution.\n
    */\n
    private async _executeAsync(\n
        inputs: NamedTensorMap,
outputs?: string[], isFunctionExecution = false,\n
        tensorArrayMap: TensorArrayMap = {},\n
        tensorListMap:
TensorListMap = {}): Promise<Tensor[]> {\n
    if (!isFunctionExecution) {\n
        inputs = this.mapInputs(inputs);\n
        this.checkInputs(inputs);\n
        this.checkInputShapeAndType(inputs);\n
        outputs = this.mapOutputs(outputs);\n
        this.checkOutputs(outputs);\n
    }\n
    const context = new ExecutionContext(\n
        this.weightMap,
tensorArrayMap, tensorListMap,\n
        this.functionExecutorMap);\n
    // Graph with control flow op requires
runtime evaluation of the execution\n
    // order, while without control flow the execution order is pre-determined\n
    // in the compile method.\n
    const tensorMap = await this.executeWithControlFlow(\n
        inputs, context, outputs,
isFunctionExecution);\n
    const results = outputs.map(name => getTensor(name, tensorMap, context));\n
    //
dispose all the intermediate tensors\n
    const outputIds = results.map(t => t.id);\n
    const inputIds =
Object.keys(inputs).map(name => inputs[name].id);\n
    const keepIds =\n
new Set<number>([...outputIds,
...inputIds, ...this.weightIds]);\n
    Object.keys(tensorMap).forEach(key => {\n
        const tensorArray =
tensorMap[key];\n
        tensorArray.forEach(tensor => {\n
            if (tensor && !tensor.isDisposed &&

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!keepIds.has(tensor.id)) {\n      tensor.dispose();\n    }\n  });\n  }\n  // dispose the context for the root
executor\n  if (this.parent == null) {\n    context.dispose(keepIds);\n  }\n  return results;\n }\n\n async
executeFunctionAsync(\n  inputs: Tensor[], tensorArrayMap: TensorArrayMap,\n  tensorListMap:
TensorListMap): Promise<Tensor[]> {\n  const mappedInputs = inputs.reduce((map, tensor, index) => {\n
map[this.inputs[index].name] = tensor;\n  return map;\n }, {} as NamedTensorMap);\n\n  return
this._executeAsync(\n    mappedInputs, this.outputNodes, true, tensorArrayMap, tensorListMap);\n }\n /**\n *
When there are control flow nodes in the graph, the graph execution use\n * ExecutionContext to keep track of the
frames and loop iterators.\n * @param inputs placeholder tensors for the graph.\n * @param context the execution
context object for current execution.\n * @param outputNames Optional. output node name from the Tensorflow
model,\n * if no outputs are specified, the default outputs of the model would be\n * used. You can inspect
intermediate nodes of the model by adding them to the\n * outputs array.\n * @param isFunctionExecution Flag
for executing a function.\n */\n private async executeWithControlFlow(\n  inputs: NamedTensorMap, context:
ExecutionContext, outputNames?: string[],\n  isFunctionExecution?: boolean): Promise<NamedTensorsMap> {\n
  const names = Object.keys(inputs);\n  const inputNodes =\n    names.map(name =>
this.graph.nodes[parseNodeName(name)[0]]);\n  const outputNodeNames = outputNames.map(name =>
parseNodeName(name)[0]);\n  let outputNodes = outputNodeNames.map(name => this.graph.nodes[name]);\n\n
// If no outputs are specified, then use the default outputs of the model.\n  if (outputNodes.length === 0) {\n
outputNodes = this._outputs;\n  }\n\n  const {usedNodes, missingInputs, dynamicNode, syncInputs} =\n
getExecutionSubgraph(\n    inputs, outputNodes, this.weightMap, this._initNodes);\n\n  // First nodes to
execute include inputNodes, weights, and initNodes.\n  const stack: NodeWithContexts[] = [\n    ...inputNodes,
...this.graph.weights, ...(this._initNodes || [])\n  ].map(node => {\n    return {node, contexts:
context.currentContext};\n  });\n  const tensorsMap: NamedTensorsMap = {...this.weightMap};\n\n
Object.keys(inputs).forEach(name => {\n  const [nodeName, index] = parseNodeName(name);\n  const
tensors: Tensor[] = [];\n  tensors[index] = inputs[name];\n  tensorsMap[nodeName] = tensors;\n });\n  const
intermediateTensorConsumerCount: {[key: number]: number} = {};\n  const tensorsToKeep =
this.getFrozenTensorIds(tensorsMap);\n  const added: {[key: string]: boolean} = {};\n  while (stack.length > 0)
{\n  const promises = this.processStack(\n    inputNodes, stack, context, tensorsMap, added, tensorsToKeep,\n
    outputNodeNames, intermediateTensorConsumerCount, usedNodes);\n  await Promise.all(promises);\n  }\n
  if (dynamicNode == null && !isFunctionExecution) {\n    console.warn(\n      `This model execution did not
contain any nodes with control flow ` +\n      `or dynamic output shapes. You can use model.execute()
instead.`);\n  }\n  const missingOutputs =\n    outputNodes\n      .filter(\n        node =>
!isControlFlow(node) &&\n          !getTensor(node.name, tensorsMap, context))\n      .map(node =>
node.name);\n  if (missingOutputs.length > 0) {\n    let alternativeMsg = `;\n    if (dynamicNode != null) {\n
alternativeMsg =\n      `Alternatively, to avoid the dynamic ops, use model.execute() ` +\n      `and specify
the inputs [${syncInputs}]`;\n    }\n    throw new Error(\n      `Cannot compute the outputs [${missingOutputs}]
from the provided ` +\n      `inputs [${names}]. Consider providing the following inputs: ` +\n
`${missingInputs}. ${alternativeMsg}`);\n  }\n  return tensorsMap;\n }\n\n private processStack(\n
inputNodes: Node[], stack: NodeWithContexts[], context: ExecutionContext,\n  tensorMap: NamedTensorsMap,
added: {[key: string]: boolean},\n  tensorsToKeep: Set<number>, outputNames: string[],\n
intermediateTensorConsumerCount: {[key: number]: number},\n  usedNodes: Set<string>) {\n  const promises:
Array<Promise<Tensor[]>> = [];\n  while (stack.length > 0) {\n  const item = stack.pop();\n
context.currentContext = item.contexts;\n  let nodeName = `;\n  // The tensor of the Enter op with isConstant
set should be set\n  // in the parent scope, so it will be available as constant for the\n  // whole loop.\n  if
(item.node.op === 'Enter' &&\n    getParamValue('isConstant', item.node, tensorMap, context)) {\n
[nodeName] = getNodeNameAndIndex(item.node.name, context);\n  }\n\n  // only process nodes that are not in
the tensorMap yet, this include\n  // inputNodes and internal initNodes.\n  if (tensorMap[item.node.name] ==
null) {\n  const tensors =\n    executeOp(item.node, tensorMap, context, this._resourceManager);\n  if
(!nodeName) {\n    [nodeName] = getNodeNameAndIndex(item.node.name, context);\n  }\n  const

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currentContext = context.currentContext;\n    if (util.isPromise(tensors)) {\n        promises.push((tensors as\nPromise<Tensor[]>).then(t => {\n            tensorMap[nodeName] = t;\n            context.currentContext =\n            currentContext;\n            this.checkTensorForDisposal(\n                nodeName, item.node, tensorMap, context,\ntensorsToKeep,\n                outputNames, intermediateTensorConsumerCount);\n            this.processChildNodes(\n                item.node, stack, context, tensorMap, added, usedNodes);\n            return t;\n        }));\n    } else {\n        tensorMap[nodeName] = tensors as Tensor[];\n        this.checkTensorForDisposal(\n            nodeName,\n            item.node, tensorMap, context, tensorsToKeep,\n            outputNames, intermediateTensorConsumerCount);\n        this.processChildNodes(\n            item.node, stack, context, tensorMap, added, usedNodes);\n    }\n} else {\n    this.processChildNodes(\n        item.node, stack, context, tensorMap, added, usedNodes);\n}\n}\n}\nreturn promises;\n}\n\nprivate processChildNodes(\n    node: Node, stack: NodeWithContexts[], context:\n    ExecutionContext,\n    tensorMap: NamedTensorsMap, added: {[key: string]: boolean},\n    usedNodes:\n    Set<string>) {\n    node.children.forEach((childNode) => {\n        const [nodeName, ] =\n        getNodeNameAndIndex(childNode.name, context);\n        if (added[nodeName] || !usedNodes.has(childNode.name))\n        {\n            return;\n        }\n        // Merge op can be pushed if any of its inputs has value.\n        if (childNode.op ===\n        'Merge') {\n            if (childNode.inputNames.some(name => {\n                return !!getTensor(name, tensorMap,\n                context);\n            })) {\n                added[nodeName] = true;\n                stack.push({ contexts: context.currentContext,\n                node: childNode });\n            } else // Otherwise all inputs must to have value.\n            if\n            (childNode.inputNames.every(name => {\n                return !!getTensor(name, tensorMap, context);\n            })))\n            {\n                added[nodeName] = true;\n                stack.push({ contexts: context.currentContext, node: childNode });\n            }\n        }\n    });\n}\n\n/**\n * Releases the memory used by the weight tensors.\n */\nprivate dispose() {\n    Object.keys(this.weightMap)\n        .forEach(\n            key => this.weightMap[key].forEach(tensor =>\ntensor.dispose()));\n}\n\nprivate checkInputShapeAndType(inputs: NamedTensorMap) {\n    Object.keys(inputs).forEach(name => {\n        const input = inputs[name];\n        const [nodeName, ] =\n        parseNodeName(name);\n        const node = this.graph.nodes[nodeName];\n        if (node.attrParams['shape'] &&\n        node.attrParams['shape'].value) {\n            const shape = node.attrParams['shape'].value as number[];\n            const\n            match = shape.length === input.shape.length &&\n            input.shape.every(\n                (dim, index) =>\n                shape[index] === -1 || shape[index] === dim);\n            util.assert(\n                match,\n                () => `The shape of\n                dict['${node.name}'] provided in ` +\n                `model.execute(dict) must be [${shape}], but was ` +\n                `${input.shape}`);\n        }\n        if (node.attrParams['dtype'] && node.attrParams['dtype'].value) {\n            util.assert(\n                input.dtype === node.attrParams['dtype'].value as string,\n                () => `The dtype of\n                dict['${node.name}'] provided in ` +\n                `model.execute(dict) must be ` +\n                `${node.attrParams['dtype'].value}, but was ${input.dtype}`);\n        }\n    });\n}\n\nprivate mapInputs(inputs:\n    NamedTensorMap) {\n    const result: NamedTensorMap = {};\n    for (const inputName in inputs) {\n        if\n        (this._signature !== null && this._signature.inputs !== null &&\n        this._signature.inputs[inputName] !== null) {\n            const tensor = this._signature.inputs[inputName];\n            result[tensor.name] = inputs[inputName];\n        } else {\n            result[inputName] = inputs[inputName];\n        }\n    }\n    return result;\n}\n\nprivate checkInputs(inputs:\n    NamedTensorMap) {\n    const notInGraph = Object.keys(inputs).filter(name => {\n        const [nodeName] =\n        parseNodeName(name);\n        return this.graph.nodes[nodeName] == null;\n    });\n    if (notInGraph.length > 0) {\n        throw new Error(\n            `The dict provided in model.execute(dict) has ` +\n            `keys: [${notInGraph}] that are\n            not part of graph`);\n    }\n}\n\nprivate mapOutputs(outputs: string[]) {\n    return outputs.map(name => {\n        if\n        (this._signature !== null && this._signature.outputs !== null &&\n        this._signature.outputs[name] !== null) {\n            const tensor = this._signature.outputs[name];\n            return tensor.name;\n        }\n        return name;\n    }, {});\n}\n\nprivate checkOutputs(outputs: string[]): void {\n    outputs.forEach(name => {\n        const [normalizedName] =\n        parseNodeName(name);\n        if (!this.graph.nodes[normalizedName]) {\n            throw new Error(`The output\n            '${name}' is not found in the graph`);\n        }\n    });\n}\n\n"}\n\n/**\n * @license\n * Copyright 2020 Google LLC.\n * All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this\n * file except in compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n * Unless required by applicable law or agreed to in writing,\n
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
=====\n*\nimport {HashMap, NamedTensorMap} from './data/types';\nimport {HashTable} from './hash_table';\n\n/**\n * Contains global resources of a model.\n */\nexport class ResourceManager {\n  constructor(\n    readonly hashTableNameToHandle: NamedTensorMap = {},\n    readonly hashMap: HashMap = {}) {\n  }\n\n  /**\n   * Register a `HashTable` in the resource manager.\n   * \n   * The `HashTable` can be retrieved by `resourceManager.getHashTableById`,\n   * where id is the table handle tensor's id.\n   * \n   * @param name Op node name that creates the `HashTable`.\n   * @param hashTable The `HashTable` to be added to resource manager.\n   */\n  addHashTable(name: string, hashTable: HashTable) {\n    this.hashTableNameToHandle[name] = hashTable.handle;\n    this.hashMap[hashTable.id] = hashTable;\n  }\n\n  /**\n   * Get the table handle by node name.\n   * \n   * @param name Op node name that creates the `HashTable`. This name is also\n   * used in the inputs list of lookup and import `HashTable` ops.\n   */\n  getHashTableHandleByName(name: string) {\n    return this.hashTableNameToHandle[name];\n  }\n\n  /**\n   * Get the actual `HashTable` by its handle tensor's id.\n   * \n   * @param id The id of the handle tensor.\n   */\n  getHashTableById(id: number): HashTable {\n    return this.hashMap[id];\n  }\n\n  /**\n   * Dispose `ResourceManager`, including its hashTables and tensors in them.\n   */\n  dispose() {\n    for (const key in this.hashMap) {\n      this.hashMap[key].clearAndClose();\n      delete this.hashMap[key];\n    }\n\n    for (const name in this.hashTableNameToHandle) {\n      this.hashTableNameToHandle[name].dispose();\n      delete this.hashTableNameToHandle[name];\n    }\n  }\n}\n\n"/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\n=====\n\n
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=====\n*\nimport {InferenceModel, io, ModelPredictConfig, NamedTensorMap, Tensor} from '@tensorflow/tfjs-core';\nimport * as tensorflow from './data/compiled_api';\nimport {NamedTensorsMap, TensorInfo} from './data/types';\nimport {OperationMapper} from './operations/operation_mapper';\nimport {GraphExecutor} from './graph_executor';\nimport {ResourceManager} from './resource_manager';\n\nexport const TFHUB_SEARCH_PARAM = '?tfjs-format=file';\nexport const DEFAULT_MODEL_NAME = 'model.json';\n\n/**\n * A `tf.GraphModel` is a directed, acyclic graph built from a\n * SavedModel GraphDef and allows inference execution.\n * \n * A `tf.GraphModel` can only be created by loading from a model converted from\n * a [TensorFlow SavedModel](https://www.tensorflow.org/guide/saved_model) using\n * the command line converter tool and loaded via `tf.loadGraphModel`.\n * \n * @doc {heading: 'Models', subheading: 'Classes'}\n */\nexport class GraphModel implements InferenceModel {\n  private executor: GraphExecutor;\n  private version = 'n/a';\n  private handler: io.IOHandler;\n  private artifacts: io.ModelArtifacts;\n  private initializer: GraphExecutor;\n  private resourceManager: ResourceManager;\n  private signature: tensorflow.ISignatureDef;\n\n  // Returns the version information for the tensorflow model GraphDef.\n  get modelVersion(): string {\n    return this.version;\n  }\n\n  get inputNodes(): string[] {\n    return this.executor.inputNodes;\n  }\n\n  get outputNodes(): string[] {\n    return this.executor.outputNodes;\n  }\n\n  get inputs(): TensorInfo[] {\n    return this.executor.inputs;\n  }\n\n  get outputs(): TensorInfo[] {\n    return this.executor.outputs;\n  }\n\n  get weights(): NamedTensorsMap {\n    return this.executor.weightMap;\n  }\n\n  get metadata(): {} {\n    return this.artifacts.userDefinedMetadata;\n  }\n\n  get modelSignature(): {} {\n    return this.signature;\n  }\n\n  /**\n   * @param modelUrl url for the model, or an `io.IOHandler`.\n   * \n   * @param weightManifestUrl url for the weight file generated by\n   * scripts/convert.py script.\n   * \n   * @param requestOptions options for Request, which allows to send credentials\n   * and custom\n   */\n\n
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headers.\n * @param onProgress Optional, progress callback function, fired periodically\n * before the load is
completed.\n *\n constructor(\n   private modelUrl: string|io.IOHandler,\n   private loadOptions:
io.LoadOptions = {}) {\n   if (loadOptions === null) {\n     this.loadOptions = {};\n   }\n   this.resourceManager =
new ResourceManager();\n }\n\n private findIOHandler() {\n   const path = this.modelUrl;\n   if ((path as
io.IOHandler).load != null) {\n     // Path is an IO Handler.\n     this.handler = path as io.IOHandler;\n   } else if
(this.loadOptions.requestInit != null) {\n     this.handler = io.browserHTTPRequest(path as string,
this.loadOptions);\n   } else {\n     const handlers = io.getLoadHandlers(path as string, this.loadOptions);\n     if
(handlers.length === 0) {\n       // For backward compatibility: if no load handler can be found,\n       // assume it is
a relative http path.\n       handlers.push(io.browserHTTPRequest(path as string, this.loadOptions));\n     } else if
(handlers.length > 1) {\n       throw new Error(\n         `Found more than one (${handlers.length}) load handlers
for ` +\n         `URL '${[path]}'`);\n     }\n     this.handler = handlers[0];\n   }\n }\n\n /**\n * Loads the model
and weight files, construct the in memory weight map and\n * compile the inference graph.\n *\n async load():
Promise<boolean> {\n   this.findIOHandler();\n   if (this.handler.load == null) {\n     throw new Error(\n
'Cannot proceed with model loading because the IOHandler provided ' +\n     'does not have the `load` method
implemented.);\n   }\n   const artifacts = await this.handler.load();\n\n   return this.loadSync(artifacts);\n }\n\n
/**\n * Synchronously construct the in memory weight map and\n * compile the inference graph. Also initialize
hashtable if any.\n *\n * @doc {heading: 'Models', subheading: 'Classes', ignoreCI: true}\n *\n
loadSync(artifacts: io.ModelArtifacts) {\n   this.artifacts = artifacts;\n   const graph = this.artifacts.modelTopology
as tensorflow.IGraphDef;\n\n   let signature;\n   if (this.artifacts.userDefinedMetadata != null &&\n
this.artifacts.userDefinedMetadata.signature != null) {\n     signature = // tslint:disable-next-line:no-any\n
(this.artifacts.userDefinedMetadata as any).signature as\n     tensorflow.ISignatureDef;\n   } else {\n     signature
= this.artifacts.signature;\n   }\n   this.signature = signature;\n\n   this.version =
`${graph.versions.producer}.${graph.versions.minConsumer}`;\n   const weightMap =\n
io.decodeWeights(this.artifacts.weightData, this.artifacts.weightSpecs);\n   this.executor = new GraphExecutor(\n
   OperationMapper.Instance.transformGraph(graph, this.signature);\n   this.executor.weightMap =
this.convertTensorMapToTensorsMap(weightMap);\n   // Attach a model-level resourceManager to each executor
to share resources,\n   // such as `HashTable`.\n   this.executor.resourceManager = this.resourceManager;\n\n   if
(artifacts.modelInitializer != null &&\n     (artifacts.modelInitializer as tensorflow.IGraphDef).node != null) {\n
const initializer =\n     OperationMapper.Instance.transformGraph(artifacts.modelInitializer);\n     this.initializer
= new GraphExecutor(initializer);\n     this.initializer.weightMap = this.executor.weightMap;\n     // Attach a
model-level resourceManager to the initializer, the\n     // hashTables created from when executing the initializer
will be stored\n     // in the resourceManager.\n     this.initializer.resourceManager = this.resourceManager;\n
this.initializer.executeAsync({}, []);\n   }\n\n   return true;\n }\n\n /**\n * Save the configuration and/or weights
of the GraphModel.\n *\n * An `IOHandler` is an object that has a `save` method of the proper\n * signature
defined. The `save` method manages the storing or\n * transmission of serialized data ("artifacts") that represent
the\n * model's topology and weights onto or via a specific medium, such as\n * file downloads, local storage,
IndexedDB in the web browser and HTTP\n * requests to a server. TensorFlow.js provides `IOHandler`\n *
implementations for a number of frequently used saving mediums, such as\n * `tf.io.browserDownloads` and
`tf.io.browserLocalStorage`. See `tf.io`\n * for more details.\n *\n * This method also allows you to refer to
certain types of `IOHandler`\n * as URL-like string shortcuts, such as 'localStorage://' and\n * 'indexeddb://'.\n
*\n * Example 1: Save `model`'s topology and weights to browser [local\n *
storage](https://developer.mozilla.org/en-US/docs/Web/API/Window/localStorage);\n * then load it back.\n *\n
*\n * ```js\n * const modelUrl =\n *   'https://storage.googleapis.com/tfjs-
models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await tf.loadGraphModel(modelUrl);\n
*\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n *\n * const saveResults = await
model.save('localStorage://my-model-1');\n *\n * const loadedModel = await
tf.loadGraphModel('localStorage://my-model-1');\n * console.log('Prediction from loaded model:');\n *\n
model.predict(zeros).print();\n * ```\n *\n * @param handlerOrURL An instance of `IOHandler` or a URL-

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like, \n * scheme-based string shortcut for `IOHandler`. \n * @param config Options for saving the model. \n *
@returns A `Promise` of `SaveResult`, which summarizes the result of \n * the saving, such as byte sizes of the
saved artifacts for the model's \n * topology and weight values. \n * \n * @doc {heading: 'Models', subheading:
'Classes', ignoreCI: true} \n * ^ \n async save(handlerOrURL: io.IOHandler|string, config?: io.SaveConfig): \n
Promise<io.SaveResult> { \n   if (typeof handlerOrURL === 'string') { \n     const handlers =
io.getSaveHandlers(handlerOrURL); \n     if (handlers.length === 0) { \n       throw new Error(\n         `Cannot find
any save handlers for URL '${handlerOrURL}'`); \n     } else if (handlers.length > 1) { \n       throw new Error(\n
         `Found more than one (${handlers.length}) save handlers for ` + \n         `URL '${handlerOrURL}'`); \n     } \n
handlerOrURL = handlers[0]; \n   } \n   if (handlerOrURL.save === null) { \n     throw new Error(\n
'GraphModel.save() cannot proceed because the IOHandler ' + \n     'provided does not have the `save` attribute
defined. '); \n   } \n   return handlerOrURL.save(this.artifacts); \n } \n \n /** \n * Execute the inference for the input
tensors. \n * \n * @param input The input tensors, when there is single input for the model, \n * inputs param
should be a `tf.Tensor`. For models with multiple inputs, \n * inputs params should be in either `tf.Tensor[]` if the
input order is \n * fixed, or otherwise NamedTensorMap format. \n * \n * For model with multiple inputs, we
recommend you use NamedTensorMap as the \n * input type, if you use `tf.Tensor[]`, the order of the array needs
to \n * follow the \n * order of inputNodes array. @see {@link GraphModel.inputNodes} \n * \n * You can also
feed any intermediate nodes using the NamedTensorMap as the \n * input type. For example, given the graph \n *
InputNode => Intermediate => OutputNode, \n * you can execute the subgraph Intermediate => OutputNode by
calling \n * model.execute('IntermediateNode': tf.tensor(...)); \n * \n * This is useful for models that uses
tf.dynamic_rnn, where the intermediate \n * state needs to be fed manually. \n * \n * For batch inference
execution, the tensors for each input need to be \n * concatenated together. For example with mobilenet, the
required input shape \n * is [1, 244, 244, 3], which represents the [batch, height, width, channel]. \n * If we are
provide a batched data of 100 images, the input tensor should be \n * in the shape of [100, 244, 244, 3]. \n * \n *
@param config Prediction configuration for specifying the batch size and \n * output node names. Currently the
batch size option is ignored for graph \n * model. \n * \n * @returns Inference result tensors. The output would be
single `tf.Tensor` \n * if model has single output node, otherwise Tensor[] or NamedTensorMap[] \n * will be
returned for model with multiple outputs. \n * \n * @doc {heading: 'Models', subheading: 'Classes'} \n * ^ \n
predict(inputs: Tensor|Tensor[]|NamedTensorMap, config?: ModelPredictConfig): \n
Tensor|Tensor[]|NamedTensorMap { \n   return this.execute(inputs, this.outputNodes); \n } \n \n private
normalizeInputs(inputs: Tensor|Tensor[]| \n   NamedTensorMap): NamedTensorMap { \n   if (!(inputs
instanceof Tensor) && !Array.isArray(inputs)) { \n     // The input is already a NamedTensorMap. \n     return
inputs; \n   } \n   inputs = Array.isArray(inputs) ? inputs : [inputs]; \n   if (inputs.length !== this.inputNodes.length)
{ \n     throw new Error(\n       'Input tensor count mismatch,' + \n       `the graph model has
${this.inputNodes.length} placeholders, ` + \n       `while there are ${inputs.length} input tensors.`); \n   } \n
return this.inputNodes.reduce((map, inputName, i) => { \n     map[inputName] = (inputs as Tensor[])[i]; \n     return
map; \n   }, {} as NamedTensorMap); \n } \n \n private normalizeOutputs(outputs: string|string[]): string[] { \n
outputs = outputs || this.outputNodes; \n   return !Array.isArray(outputs) ? [outputs] : outputs; \n } \n \n /** \n *
Executes inference for the model for given input tensors. \n * @param inputs tensor, tensor array or tensor map of
the inputs for the \n * model, keyed by the input node names. \n * @param outputs output node name from the
Tensorflow model, if no \n * outputs are specified, the default outputs of the model would be used. \n * You can
inspect intermediate nodes of the model by adding them to the \n * outputs array. \n * \n * @returns A single
tensor if provided with a single output or no outputs \n * are provided and there is only one default output,
otherwise return a \n * tensor array. The order of the tensor array is the same as the outputs \n * if provided,
otherwise the order of outputNodes attribute of the model. \n * \n * @doc {heading: 'Models', subheading:
'Classes'} \n * ^ \n execute(inputs: Tensor|Tensor[]|NamedTensorMap, outputs?: string|string[]): \n
Tensor|Tensor[] { \n   inputs = this.normalizeInputs(inputs); \n   outputs = this.normalizeOutputs(outputs); \n   const
result = this.executor.execute(inputs, outputs); \n   return result.length > 1 ? result : result[0]; \n } \n \n /** \n *
Executes inference for the model for given input tensors in async \n * fashion, use this method when your model

```



```

contains control flow ops.\n * @param inputs tensor, tensor array or tensor map of the inputs for the\n * model,
keyed by the input node names.\n * @param outputs output node name from the Tensorflow model, if no outputs\n
* are specified, the default outputs of the model would be used. You can\n * inspect intermediate nodes of the
model by adding them to the outputs\n * array.\n * \n * @returns A Promise of single tensor if provided with a
single output or\n * no outputs are provided and there is only one default output, otherwise\n * return a tensor
map.\n * \n * @doc {heading: 'Models', subheading: 'Classes'}\n * \n async executeAsync(\n inputs:
Tensor|Tensor[]|NamedTensorMap,\n outputs?: string|string[]): Promise<Tensor|Tensor[]> {\n inputs =
this.normalizeInputs(inputs);\n outputs = this.normalizeOutputs(outputs);\n const result = await
this.executor.executeAsync(inputs, outputs);\n return result.length > 1 ? result : result[0];\n } \n\n private
convertTensorMapToTensorsMap(map: NamedTensorMap): NamedTensorsMap {\n return
Object.keys(map).reduce((newMap: NamedTensorsMap, key) => {\n newMap[key] = [map[key]]; \n return
newMap;\n }, {});\n } \n\n /**\n * Releases the memory used by the weight tensors and resourceManager.\n
*\n * @doc {heading: 'Models', subheading: 'Classes'}\n * \n dispose() {\n this.executor.dispose();\n\n if
(this.initializer) {\n this.initializer.dispose();\n }\n\n this.resourceManager.dispose();\n }\n} \n\n/**\n * Load
a graph model given a URL to the model definition.\n * \n * Example of loading MobileNetV2 from a URL and
making a prediction with a\n * zeros input:\n * \n * ```\n * const modelUrl =\n *
'https://storage.googleapis.com/tfjs-models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await
tf.loadGraphModel(modelUrl);\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n *
```\n * \n * Example of loading MobileNetV2 from a TF Hub URL and making a prediction with\n * a zeros input:\n * \n *
```\n * const modelUrl =\n * 'https://tfhub.dev/google/imagenet/mobilenet_v2_140_224/classification/2';\n *
const model = await tf.loadGraphModel(modelUrl, {fromTFHub: true});\n * const zeros = tf.zeros([1, 224, 224,
3]);\n * model.predict(zeros).print();\n * ```\n * \n * @param modelUrl The url or an `io.IOHandler` that loads the
model.\n * \n * @param options Options for the HTTP request, which allows to send credentials\n * and custom
headers.\n * \n * @doc {heading: 'Models', subheading: 'Loading'}\n * \n\n export async function loadGraphModel(\n
modelUrl: string|io.IOHandler,\n options: io.LoadOptions = {}): Promise<GraphModel> {\n if (modelUrl ==
null) {\n throw new Error(\n 'modelUrl in loadGraphModel() cannot be null. Please provide a url ' +\n 'or
an IOHandler that loads the model');\n }\n if (options == null) {\n options = {};\n }\n\n if (options.fromTFHub)
{\n if ((modelUrl as io.IOHandler).load == null) {\n if (!(modelUrl as string).endsWith('/')) {\n modelUrl =
(modelUrl as string) + '/;\n }\n modelUrl =
`${modelUrl}${DEFAULT_MODEL_NAME}${TFHUB_SEARCH_PARAM}`;\n }\n }\n const model = new
GraphModel(modelUrl, options);\n await model.load();\n return
model;\n } \n\n",null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,"**\n * dat-gui
JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n * \n * Copyright 2011 Data Arts Team, Google
Creative Lab\n * \n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n\n import Color from './color/Color';\n import math from
'./color/math';\n import interpret from './color/interpret';\n import Controller from './controllers/Controller';\n import
BooleanController from './controllers/BooleanController';\n import OptionController from
'./controllers/OptionController';\n import StringController from './controllers/StringController';\n import
NumberController from './controllers/NumberController';\n import NumberControllerBox from
'./controllers/NumberControllerBox';\n import NumberControllerSlider from
'./controllers/NumberControllerSlider';\n import FunctionController from './controllers/FunctionController';\n import
ColorController from './controllers/ColorController';\n import domImport from './dom/dom';\n import GUIImport
from './gui/GUI';\n\n export const color = {\n Color: Color,\n math: math,\n interpret: interpret;\n};\n\n export const
controllers = {\n Controller: Controller,\n BooleanController: BooleanController,\n OptionController:
OptionController,\n StringController: StringController,\n NumberController: NumberController,\n
NumberControllerBox: NumberControllerBox,\n NumberControllerSlider: NumberControllerSlider,\n
FunctionController: FunctionController,\n ColorController: ColorController;\n};\n\n export const dom = { dom:

```

```

domImport };
\n\nexport const gui = { GUI: GUIImport };
\n\nexport const GUI = GUIImport;
\n\nexport default {
\n  color,
\n  controllers,
\n  dom,
\n  gui,
\n  GUI
\n};
\n",
\n/**
\n * dat-gui JavaScript Controller Library
\n *
\n * http://code.google.com/p/dat-gui
\n *
\n * Copyright 2011 Data Arts Team, Google Creative Lab
\n *
\n * Licensed under the Apache License, Version 2.0 (the "License");
\n * you may not use this file except in compliance with the
\n * License.
\n * You may obtain a copy of the License at
\n *
\n * http://www.apache.org/licenses/LICENSE-2.0
\n *
\n */
\n\nexport default function(color, forceCSSHex) {
\n  const colorFormat =
\n  color.__state.conversionName.toString();
\n\n  const r = Math.round(color.r);
\n  const g = Math.round(color.g);
\n  const b = Math.round(color.b);
\n  const a = color.a;
\n  const h = Math.round(color.h);
\n  const s =
\n  color.s.toFixed(1);
\n  const v = color.v.toFixed(1);
\n\n  if (forceCSSHex || (colorFormat ===
\n  'THREE_CHAR_HEX') || (colorFormat === 'SIX_CHAR_HEX')) {
\n    let str = color.hex.toString(16);
\n    while
\n    (str.length < 6) {
\n      str = '0' + str;
\n    }
\n    return '#' + str;
\n  } else if (colorFormat === 'CSS_RGB') {
\n    return
\n    'rgb(' + r + ',' + g + ',' + b + ')';
\n  } else if (colorFormat === 'CSS_RGBA') {
\n    return
\n    'rgba(' + r + ',' + g + ',' + b +
\n    ',' + a + ')';
\n  } else if (colorFormat === 'HEX') {
\n    return
\n    '0x' + color.hex.toString(16);
\n  } else if (colorFormat
\n  === 'RGB_ARRAY') {
\n    return
\n    '[' + r + ',' + g + ',' + b + ']';
\n  } else if (colorFormat === 'RGBA_ARRAY') {
\n    return
\n    '[' + r + ',' + g + ',' + b + ',' + a + ']';
\n  } else if (colorFormat === 'RGB_OBJ') {
\n    return
\n    '{r:' + r + ',g:' + g + ',b:' + b + '}';
\n  } else if (colorFormat === 'RGBA_OBJ') {
\n    return
\n    '{r:' + r + ',g:' + g + ',b:' + b + ',a:' + a + '}';
\n  } else if (colorFormat === 'HSV_OBJ') {
\n    return
\n    '{h:' + h + ',s:' + s + ',v:' + v + '}';
\n  } else if (colorFormat ===
\n  'HSVA_OBJ') {
\n    return
\n    '{h:' + h + ',s:' + s + ',v:' + v + ',a:' + a + '}';
\n  }
\n\n  return 'unknown
\nformat';
\n}\n",
\n/**
\n * dat-gui JavaScript Controller Library
\n *
\n * http://code.google.com/p/dat-gui
\n *
\n * Copyright 2011 Data Arts Team, Google Creative Lab
\n *
\n * Licensed under the Apache License, Version 2.0 (the
\n * "License");
\n * you may not use this file except in compliance with the
\n * License.
\n * You may obtain a copy of the
\n * License at
\n *
\n * http://www.apache.org/licenses/LICENSE-2.0
\n *
\n */
\n\nconst ARR_EACH =
\n  Array.prototype.forEach;
\n\nconst ARR_SLICE = Array.prototype.slice;
\n\n/**
\n * Band-aid methods for things that
\n * should be a lot easier in JavaScript.
\n * Implementation and structure inspired by underscore.js
\n *
\n * http://documentcloud.github.com/underscore/
\n */
\n\nconst Common = {
\n  BREAK: {},
\n  extend:
\n  function(target) {
\n    this.each(ARR_SLICE.call(arguments, 1), function(obj) {
\n      const keys = this.isObject(obj)
\n      ? Object.keys(obj) : [];
\n      keys.forEach(function(key) {
\n        if (!this.isUndefined(obj[key])) {
\n          target[key] = obj[key];
\n        }
\n      }).bind(this);
\n    }, this);
\n    return target;
\n  },
\n  defaults: function(target) {
\n    this.each(ARR_SLICE.call(arguments, 1), function(obj) {
\n      const keys = this.isObject(obj)
\n      ? Object.keys(obj) : [];
\n      keys.forEach(function(key) {
\n        if (this.isUndefined(target[key])) {
\n          target[key]
\n          = obj[key];
\n        }
\n      }).bind(this);
\n    }, this);
\n    return target;
\n  },
\n  compose: function() {
\n    const
\n    toCall = ARR_SLICE.call(arguments);
\n    return function() {
\n      let args = ARR_SLICE.call(arguments);
\n      for
\n      (let i = toCall.length - 1; i >= 0; i--) {
\n        args = [toCall[i].apply(this, args)];
\n      }
\n      return args[0];
\n    };
\n  },
\n  each: function(obj, itr, scope) {
\n    if (!obj) {
\n      return;
\n    }
\n    if (ARR_EACH && obj.forEach &&
\n    obj.forEach === ARR_EACH) {
\n      obj.forEach(itr, scope);
\n    } else if (obj.length === obj.length + 0) {
\n      // Is
\n      number but not NaN
\n      let key;
\n      let l;
\n      for (key = 0, l = obj.length; key < l; key++) {
\n        if (key in obj
\n        && itr.call(scope, obj[key], key) === this.BREAK) {
\n          return;
\n        }
\n      }
\n    } else {
\n      for (const key
\n      in obj) {
\n        if (itr.call(scope, obj[key], key) === this.BREAK) {
\n          return;
\n        }
\n      }
\n    }
\n  },
\n  defer: function(fnc) {
\n    setTimeout(fnc, 0);
\n  },
\n  // if the function is called repeatedly, wait until threshold
\n  passes until we execute the function
\n  debounce: function(func, threshold, callImmediately) {
\n    let timeout;
\n    return function() {
\n      const obj = this;
\n      const args = arguments;
\n      function delayed() {
\n        timeout =
\n        null;
\n        if (!callImmediately) {
\n          func.apply(obj, args);
\n        }
\n        const callNow = callImmediately ||
\n        !timeout;
\n        clearTimeout(timeout);
\n        timeout =
\n        setTimeout(delayed, threshold);
\n        if (callNow) {
\n          func.apply(obj, args);
\n        }
\n      };
\n    },
\n    toArray: function(obj) {
\n      if (obj.toArray) {
\n        return
\n        obj.toArray();
\n      }
\n      return
\n      ARR_SLICE.call(obj);
\n    },
\n    isUndefined: function(obj) {
\n      return
\n      obj === undefined;
\n    },
\n    isNull:
\n    function(obj) {
\n      return
\n      obj === null;
\n    },
\n    isNaN:
\n    function(obj) {
\n      return
\n      isNaN(obj);
\n    },
\n    isArray:
\n    Array.isArray || function(obj) {
\n      return
\n      obj.constructor === Array;
\n    },
\n    isObject:
\n    function(obj) {
\n      return
\n      obj === Object(obj);
\n    },
\n    isNumber:
\n    function(obj) {
\n      return
\n      obj === obj + 0;
\n    },
\n    isString:

```

```

function(obj) {\n  return obj === obj + ";\n },\n\n isBoolean: function(obj) {\n  return obj === false || obj ===
true;\n },\n\n isFunction: function(obj) {\n  return Object.prototype.toString.call(obj) === '[object Function]';\n
}\n\n};\n\n\nexport default Common;\n", "/*\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*\n\nimport toString from './toString';\nimport common from './utils/common';\n\nconst INTERPRETATIONS =
[\n // Strings\n {\n  litmus: common.isString,\n  conversions: {\n   THREE_CHAR_HEX: {\n    read:
function(original) {\n      const test = original.match(/^#([A-F0-9])([A-F0-9])([A-F0-9])$/i);\n      if (test ===
null) {\n        return false;\n      }\n      return {\n        space: 'HEX',\n        hex: parseInt(\n
'0x' +\n        test[1].toString() + test[1].toString() +\n        test[2].toString() + test[2].toString() +\n
test[3].toString() + test[3].toString(), 0)\n      );\n    },\n    write: toString\n  },\n  SIX_CHAR_HEX:
{\n    read: function(original) {\n      const test = original.match(/^#([A-F0-9]{6})$/i);\n      if (test === null)
{\n        return false;\n      }\n      return {\n        space: 'HEX',\n        hex: parseInt('0x' +
test[1].toString(), 0)\n      );\n    },\n    write: toString\n  },\n  CSS_RGB: {\n    read:
function(original) {\n      const test = original.match(/^rgb(\(\s*(.+)\s*,\s*(.+)\s*,\s*(.+)\s*\)/);\n      if (test
=== null) {\n        return false;\n      }\n      return {\n        space: 'RGB',\n        r: parseFloat(test[1]),\n
g: parseFloat(test[2]),\n        b: parseFloat(test[3])\n      );\n    },\n    write: toString\n  },\n  CSS_RGBA: {\n
read: function(original) {\n      const test =
original.match(/^rgba(\(\s*(.+)\s*,\s*(.+)\s*,\s*(.+)\s*,\s*(.+)\s*\)/);\n      if (test === null) {\n        return
false;\n      }\n      return {\n        space: 'RGB',\n        r: parseFloat(test[1]),\n        g:
parseFloat(test[2]),\n        b: parseFloat(test[3]),\n        a: parseFloat(test[4])\n      );\n    },\n    write:
toString\n  }\n },\n\n // Numbers\n {\n  litmus: common.isNumber,\n  conversions: {\n\n   HEX: {\n
read: function(original) {\n      return {\n        space: 'HEX',\n        hex: original,\n
conversionName: 'HEX'\n      );\n    },\n    write: function(color) {\n      return color.hex;\n    }\n
}\n\n },\n\n // Arrays\n {\n  litmus: common.isArray,\n  conversions: {\n   RGB_ARRAY: {\n
read: function(original) {\n      if (original.length !== 3) {\n        return false;\n      }\n      return {\n
space: 'RGB',\n        r: original[0],\n        g: original[1],\n        b: original[2]\n      );\n    },\n    write:
function(color) {\n      return [color.r, color.g, color.b];\n    }\n  },\n  RGBA_ARRAY: {\n    read:
function(original) {\n      if (original.length !== 4) return false;\n      return {\n        space: 'RGB',\n        r:
original[0],\n        g: original[1],\n        b: original[2],\n        a: original[3]\n      );\n    },\n    write:
function(color) {\n      return [color.r, color.g, color.b, color.a];\n    }\n  }\n },\n\n // Objects\n {\n
litmus: common.isObject,\n  conversions: {\n\n   RGBA_OBJ: {\n    read: function(original) {\n      if
(common.isNumber(original.r) &&\n      common.isNumber(original.g) &&\n
common.isNumber(original.b) &&\n      common.isNumber(original.a)) {\n        return {\n          space:
'RGB',\n          r: original.r,\n          g: original.g,\n          b: original.b,\n          a: original.a\n        };
\n      }\n      return false;\n    },\n    write: function(color) {\n      return {\n        r: color.r,\n        g:
color.g,\n        b: color.b,\n        a: color.a\n      );\n    }\n  },\n  RGB_OBJ: {\n    read:
function(original) {\n      if (common.isNumber(original.r) &&\n      common.isNumber(original.g) &&\n
common.isNumber(original.b)) {\n        return {\n          space: 'RGB',\n          r: original.r,\n          g:
original.g,\n          b: original.b\n        );\n      }\n      return false;\n    },\n    write: function(color)
{\n      return {\n        r: color.r,\n        g: color.g,\n        b: color.b\n      );\n    }\n  },\n\n
HSVA_OBJ: {\n    read: function(original) {\n      if (common.isNumber(original.h) &&\n      common.isNumber(original.s) &&\n
common.isNumber(original.v) &&\n      common.isNumber(original.a)) {\n        return {\n          space: 'HSV',\n
h: original.h,\n          s: original.s,\n          v: original.v,\n          a: original.a\n        );\n      }\n      return
false;\n    },\n    write: function(color) {\n      return {\n        h: color.h,\n        s: color.s,\n        v: color.v,\n
a: color.a\n      );\n    }\n  },\n\n   HSV_OBJ: {\n    read: function(original) {\n      if

```

```
(common.isNumber(original.h) &&\n        common.isNumber(original.s) &&\n        common.isNumber(original.v)) {\n        return {\n            space: 'HSV',\n            h: original.h,\n            s:\n            original.s,\n            v: original.v\n        };\n    }\n    return false;\n  },\n  write: function(color) {\n    return {\n        h: color.h,\n        s: color.s,\n        v: color.v\n    };\n  }\n  }\n  }\n  }\n};\n\nlet toReturn;\n\nconst interpret = function() {\n  toReturn = false;\n\n  const original = arguments.length > 1\n    ? common.toArray(arguments) : arguments[0];\n\n  common.each(INTERPRETATIONS, function(family) {\n    if\n    (family.litmus(original)) {\n      common.each(family.conversions, function(conversion, conversionName) {\n        result = conversion.read(original);\n\n        if (toReturn === false && result !== false) {\n          toReturn = result;\n          result.conversionName = conversionName;\n          result.conversion = conversion;\n          return\n          common.BREAK;\n        }\n      });\n    }\n  });\n\n  return common.BREAK;\n});\n\nexport default interpret;\n\n"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n * \n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n * Licensed under the Apache License, Version 2.0 (the\n * \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n */\n\nlet tmpComponent;\n\nconst ColorMath =\n{\n  hsv_to_rgb: function(h, s, v) {\n    const hi = Math.floor(h / 60) % 6;\n\n    const f = h / 60 - Math.floor(h / 60);\n\n    const p = v * (1.0 - s);\n    const q = v * (1.0 - (f * s));\n    const t = v * (1.0 - ((1.0 - f) * s));\n\n    const c =\n    [\n      [v, t, p],\n      [q, v, p],\n      [p, v, t],\n      [p, q, v],\n      [t, p, v],\n      [v, p, q]\n    ][hi];\n\n    return {\n      r:\n      c[0] * 255,\n      g: c[1] * 255,\n      b: c[2] * 255\n    };\n  },\n  rgb_to_hsv: function(r, g, b) {\n    const min =\n    Math.min(r, g, b);\n    const max = Math.max(r, g, b);\n    const delta = max - min;\n    let h;\n    let s;\n\n    if (max\n    !== 0) {\n      s = delta / max;\n    } else {\n      return {\n        h: NaN,\n        s: 0,\n        v: 0\n      };\n    }\n\n    if (r\n    === max) {\n      h = (g - b) / delta;\n    } else if (g === max) {\n      h = 2 + (b - r) / delta;\n    } else {\n      h = 4 + (r\n      - g) / delta;\n    }\n\n    h /= 6;\n    if (h < 0) {\n      h += 1;\n    }\n\n    return {\n      h: h * 360,\n      s: s,\n      v: max / 255\n    };\n  },\n  rgb_to_hex: function(r, g, b) {\n    let hex = this.hex_with_component(0, 2, r);\n    hex =\n    this.hex_with_component(hex, 1, g);\n    hex = this.hex_with_component(hex, 0, b);\n    return hex;\n  },\n  component_from_hex: function(hex, componentIndex) {\n    return (hex >> (componentIndex * 8)) & 0xFF;\n  },\n  hex_with_component: function(hex, componentIndex, value) {\n    return value << (tmpComponent =\n    componentIndex * 8) | (hex & ~(0xFF << tmpComponent));\n  }\n};\n\nexport default ColorMath;\n\n"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n * \n * Copyright 2011 Data Arts Team,\n * Google Creative Lab\n * \n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use\n * this file except in compliance with the License.\n * You may obtain a copy of the License at\n * \n * \n * http://www.apache.org/licenses/LICENSE-2.0\n * \n */\n\nimport interpret from './interpret';\nimport math from\n './math';\nimport colorToString from './toString';\nimport common from './utils/common';\n\nclass Color {\n  constructor() {\n    this.__state = interpret.apply(this, arguments);\n\n    if (this.__state === false) {\n      throw new\n      Error('Failed to interpret color arguments');\n    }\n\n    this.__state.a = this.__state.a || 1;\n  }\n\n  toString() {\n    return colorToString(this);\n  }\n\n  toHexString() {\n    return colorToString(this, true);\n  }\n\n  toOriginal() {\n    return this.__state.conversion.write(this);\n  }\n\n  function defineRGBComponent(target, component,\n  componentHexIndex) {\n    Object.defineProperty(target, component, {\n      get: function() {\n        if\n        (this.__state.space === 'RGB') {\n          return this.__state[component];\n        }\n\n        Color.recalculateRGB(this,\n        component, componentHexIndex);\n\n        return this.__state[component];\n      },\n      set: function(v) {\n        if\n        (this.__state.space !== 'RGB') {\n          Color.recalculateRGB(this, component, componentHexIndex);\n\n          this.__state.space = 'RGB';\n        }\n\n        this.__state[component] = v;\n      }\n    });\n  }\n\n  function\n  defineHSVComponent(target, component) {\n    Object.defineProperty(target, component, {\n      get: function() {\n        if\n        (this.__state.space === 'HSV') {\n          return this.__state[component];\n        }\n\n        Color.recalculateHSV(this);\n\n        return this.__state[component];\n      },\n      set: function(v) {\n        if\n        (this.__state.space !== 'HSV') {\n          Color.recalculateHSV(this);\n          this.__state.space = 'HSV';\n        }\n\n        this.__state[component] = v;\n      }\n    });\n  }\n\n  Color.recalculateRGB = function(color, component,\n  componentHexIndex) {\n    if (color.__state.space === 'HEX') {\n      color.__state[component] =\n      math.component_from_hex(color.__state.hex, componentHexIndex);\n    } else if (color.__state.space === 'HSV') {\n
```

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    common.extend(color.__state, math.hsv_to_rgb(color.__state.h, color.__state.s, color.__state.v));\n } else {\n
throw new Error('Corrupted color state');\n };\n\nColor.recalculateHSV = function(color) {\n const result =
math.rgb_to_hsv(color.r, color.g, color.b);\n\n common.extend(color.__state,\n {\n s: result.s,\n v: result.v\n
}\n );\n\n if (!common.isNaN(result.h)) {\n color.__state.h = result.h;\n } else if
(common.isUndefined(color.__state.h)) {\n color.__state.h = 0;\n }\n\nColor.COMPONENTS = ['r', 'g', 'b', 'h',
's', 'v', 'hex', 'a'];\n\ndefineRGBComponent(Color.prototype, 'r', 2);\n\ndefineRGBComponent(Color.prototype, 'g',
1);\n\ndefineRGBComponent(Color.prototype, 'b', 0);\n\ndefineHSVComponent(Color.prototype,
'h');\n\ndefineHSVComponent(Color.prototype, 's');\n\ndefineHSVComponent(Color.prototype,
'v');\n\nObject.defineProperty(Color.prototype, 'a', {\n get: function() {\n return this.__state.a;\n },\n set:
function(v) {\n this.__state.a = v;\n }\n});\n\nObject.defineProperty(Color.prototype, 'hex', {\n get: function() {\n
if (!this.__state.space !== 'HEX') {\n this.__state.hex = math.rgb_to_hex(this.r, this.g, this.b);\n }\n\n return
this.__state.hex;\n },\n set: function(v) {\n this.__state.space = 'HEX';\n this.__state.hex = v;\n
}\n});\n\nexport default Color;\n\n"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-
gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed under the Apache License,
Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may
obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\n/**\n * @class An
"abstract" class that represents a given property of an object.\n *\n * @param {Object} object The object to be
manipulated\n *\n * @param {string} property The name of the property to be manipulated\n *\n * @class Controller {\n
constructor(object, property) {\n this.initialValue = object[property];\n\n /**\n * Those who extend this class
will put their DOM elements in here.\n *\n * @type {DOMElement}\n *\n this.domElement =
document.createElement('div');\n\n /**\n * The object to manipulate\n *\n * @type {Object}\n *\n\n
this.object = object;\n\n /**\n * The name of the property to manipulate\n *\n * @type {String}\n *\n\n
this.property = property;\n\n /**\n * The function to be called on change.\n *\n * @type {Function}\n *\n
\n * @ignore\n *\n this.__onChange = undefined;\n\n /**\n * The function to be called on finishing change.\n
\n * @type {Function}\n *\n * @ignore\n *\n this.__onFinishChange = undefined;\n }\n\n /**\n * Specify that a
function fire every time someone changes the value with\n *\n * this Controller.\n *\n * @param {Function} fnc
This function will be called whenever the value\n *\n * is modified via this Controller.\n *\n * @returns {Controller}
this\n *\n * onChange(fnc) {\n this.__onChange = fnc;\n return this;\n }\n\n /**\n * Specify that a function
fire every time someone "finishes" changing\n *\n * the value with this Controller. Useful for values that change\n *\n
incrementally like numbers or strings.\n *\n * @param {Function} fnc This function will be called whenever\n *\n
someone "finishes" changing the value via this Controller.\n *\n * @returns {Controller} this\n *\n * onFinishChange(fnc) {\n this.__onFinishChange = fnc;\n return this;\n }\n\n /**\n * Change the value of
<code>object[property]</code>\n *\n * @param {Object} newValue The new value of
<code>object[property]</code>\n *\n * set(newValue) {\n this.object[this.property] = newValue;\n if
(this.__onChange) {\n this.__onChange.call(this, newValue);\n }\n\n this.updateDisplay();\n return this;\n
}\n\n /**\n * Gets the value of <code>object[property]</code>\n *\n * @returns {Object} The current value of
<code>object[property]</code>\n *\n * getValue() {\n return this.object[this.property];\n }\n\n /**\n *
Refreshes the visual display of a Controller in order to keep sync\n *\n * with the object's current value.\n *\n * @returns
{Controller} this\n *\n * updateDisplay() {\n return this;\n }\n\n /**\n * @returns {Boolean} true if the value
has deviated from initialValue\n *\n * isModified() {\n return this.initialValue !== this.getValue();\n
}\n}\n\nexport default Controller;\n\n"/**\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nimport common from '../utils/common';\n\nconst EVENT_MAP = {\n HTMLEvents: ['change'],\n
\n MouseEvents: ['click', 'mousemove', 'mousedown', 'mouseup', 'mouseover'],\n
\n KeyboardEvents: ['keydown']\n};\n\nconst EVENT_MAP_INV = {};\n\ncommon.each(EVENT_MAP, function(v, k) {\n
\n common.each(v, function(e) {\n EVENT_MAP_INV[e] = k;\n });\n});\n\nconst CSS_VALUE_PIXELS =

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/(\\d+(\\.\\d+)?px;\\n\\nfunction cssValueToPixels(val) {\\n if (val === '0' || common.isUndefined(val)) {\\n return
0;\\n }\\n\\n const match = val.match(CSS_VALUE_PIXELS);\\n\\n if (!common.isNull(match)) {\\n return
parseFloat(match[1]);\\n }\\n\\n // TODO ...ems? %?\\n\\n return 0;\\n}\\n\\n/**\\n * @namespace\\n * @member
dat.dom\\n */\\nconst dom = {\\n\\n /**\\n *\\n * @param elem\\n * @param selectable\\n */\\n makeSelectable:
function(elem, selectable) {\\n if (elem === undefined || elem.style === undefined) return;\\n\\n elem.onselectstart
= selectable ? function() {\\n return false;\\n } : function() {\\n };\\n\\n elem.style.MozUserSelect = selectable ?
'auto' : 'none';\\n elem.style.KhtmlUserSelect = selectable ? 'auto' : 'none';\\n elem.unselectable = selectable ? 'on' :
'off';\\n },\\n\\n /**\\n *\\n * @param elem\\n * @param horizontal\\n * @param vert\\n */\\n makeFullscreen:
function(elem, hor, vert) {\\n let vertical = vert;\\n let horizontal = hor;\\n\\n if (common.isUndefined(horizontal))
{\\n horizontal = true;\\n }\\n\\n if (common.isUndefined(vertical)) {\\n vertical = true;\\n }\\n\\n
elem.style.position = 'absolute';\\n\\n if (horizontal) {\\n elem.style.left = 0;\\n elem.style.right = 0;\\n }\\n if
(vertical) {\\n elem.style.top = 0;\\n elem.style.bottom = 0;\\n }\\n },\\n\\n /**\\n *\\n * @param elem\\n *
@param eventType\\n * @param params\\n */\\n fakeEvent: function(elem, eventType, pars, aux) {\\n const
params = pars || {};\\n const className = EVENT_MAP_INV[eventType];\\n if (!className) {\\n throw new
Error('Event type ' + eventType + ' not supported.');
```

```

cssValueToPixels(style['border-bottom-width']) +\n    cssValueToPixels(style['padding-top']) +\n
cssValueToPixels(style['padding-bottom']) +\n    cssValueToPixels(style.height);\n },\n\n /**\n *\n * @param
el\n *\n getOffset: function(el) {\n    let elem = el;\n    const offset = { left: 0, top: 0 };
if (elem.offsetParent)
{\n    do {\n        offset.left += elem.offsetLeft;\n        offset.top += elem.offsetTop;\n        elem =
elem.offsetParent;\n    } while (elem);\n    }\n    return offset;\n },\n\n //
http://stackoverflow.com/posts/2684561/revisions\n /**\n *\n * @param elem\n *\n isActive: function(elem)
{\n    return elem === document.activeElement && (elem.type || elem.href);\n }\n\n};\n\nexport default
dom;\n", /**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011
Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from
'./dom/dom';\n\n/**\n *\n * @class Provides a checkbox input to alter the boolean property of an object.\n *\n *
@extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param
{string} property The name of the property to be manipulated\n *\n\nclass BooleanController extends Controller {\n
constructor(object, property) {\n    super(object, property);\n\n    const _this = this;\n    this.__prev =
this.getValue();\n\n    this.__checkbox = document.createElement('input');\n    this.__checkbox.setAttribute('type',
'checkbox');\n\n    function onChange() {\n        _this.setValue(!_this.__prev);\n    }\n\n    dom.bind(this.__checkbox,
'change', onChange, false);\n\n    this.domElement.appendChild(this.__checkbox);\n\n    // Match original value\n
this.updateDisplay();\n }
\n\n setValue(v) {\n    const toReturn = super.setValue(v);\n    if (this.__onFinishChange)
{\n        this.__onFinishChange.call(this, this.getValue());\n    }\n    this.__prev = this.getValue();\n    return
toReturn;\n }\n\n updateDisplay() {\n    if (this.getValue() === true) {\n        this.__checkbox.setAttribute('checked',
'checked');\n        this.__checkbox.checked = true;\n        this.__prev = true;\n    } else {\n        this.__checkbox.checked
= false;\n        this.__prev = false;\n    }\n\n    return super.updateDisplay();\n }\n\n\nexport default
BooleanController;\n", /**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n *
Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from
'./Controller';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\n/**\n *\n * @class Provides
a select input to alter the property of an object, using a\n * list of accepted values.\n *\n * @extends
dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string}
property The name of the property to be manipulated\n *\n * @param {Object|string[]} options A map of labels to
acceptable values, or\n * a list of acceptable string values.\n *\n\nclass OptionController extends Controller {\n
constructor(object, property, opts) {\n    super(object, property);\n\n    let options = opts;\n\n    const _this = this;\n\n
/**\n *\n * The drop down menu\n *\n * @ignore\n *\n this.__select = document.createElement('select');\n\n if
(common.isArray(options)) {\n    const map = {};\n    common.each(options, function(element) {\n
map[element] = element;\n    });\n    options = map;\n }\n\n common.each(options, function(value, key) {\n
const opt = document.createElement('option');\n    opt.innerHTML = key;\n    opt.setAttribute('value', value);\n
_this.__select.appendChild(opt);\n });\n\n // Acknowledge original value\n this.updateDisplay();\n\n
dom.bind(this.__select, 'change', function() {\n    const desiredValue = this.options[this.selectedIndex].value;\n
_this.setValue(desiredValue);\n });\n\n this.domElement.appendChild(this.__select);\n }\n\n setValue(v) {\n
const toReturn = super.setValue(v);\n\n if (this.__onFinishChange) {\n        this.__onFinishChange.call(this,
this.getValue());\n    }\n\n    return toReturn;\n }\n\n updateDisplay() {\n    if (dom.isActive(this.__select)) return
this; // prevent number from updating if user is trying to manually update\n    this.__select.value = this.getValue();\n
return super.updateDisplay();\n }\n\n\nexport default OptionController;\n", /**\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from './Controller';\nimport dom from

```

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'./dom/dom';\n\n/**\n * @class Provides a text input to alter the string property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n *\n\nclass StringController extends Controller {\n  constructor(object, property) {\n    super(object, property);\n\n    const _this = this;\n\n    function onChange() {\n      _this.setValue(_this.__input.value);\n    }\n\n    function onBlur() {\n      if (_this.__onFinishChange) {\n        _this.__onFinishChange.call(_this, _this.getValue());\n      }\n    }\n\n    this.__input =\n    document.createElement('input');\n    this.__input.setAttribute('type', 'text');\n    dom.bind(this.__input, 'keyup',\n    onChange);\n    dom.bind(this.__input, 'change', onChange);\n    dom.bind(this.__input, 'blur', onBlur);\n    dom.bind(this.__input, 'keydown', function(e) {\n      if (e.keyCode === 13) {\n        this.blur();\n      }\n    });\n\n    this.updateDisplay();\n    this.domElement.appendChild(this.__input);\n  }\n\n  updateDisplay() {\n    // Stops the\n    caret from moving on account of:\n    // keyup -> setValue -> updateDisplay\n    if (!dom.isActive(this.__input)) {\n      this.__input.value = this.getValue();\n    }\n    return super.updateDisplay();\n  }\n}\n\nexport default\nStringController;\n", /**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the\n * "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the\n * License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport Controller from\n'./Controller';\nimport common from './utils/common';\n\nfunction numDecimals(x) {\n  const _x = x.toString();\n  if (_x.indexOf('.') > -1) {\n    return _x.length - _x.indexOf('.') - 1;\n  }\n  return 0;\n}\n\n/**\n * @class\n * Represents a given property of an object that is a number.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n *\n * @param {string} property The name of the property to\n * be manipulated\n *\n * @param {Object} [params] Optional parameters\n *\n * @param {Number} [params.min]\n * Minimum allowed value\n *\n * @param {Number} [params.max] Maximum allowed value\n *\n * @param {Number}\n * [params.step] Increment by which to change value\n *\n\nclass NumberController extends Controller {\n  constructor(object, property, params) {\n    super(object, property);\n\n    const _params = params || {};\n\n    this.__min = _params.min;\n    this.__max = _params.max;\n    this.__step = _params.step;\n\n    if\n    (common.isUndefined(this.__step)) {\n      if (this.initialValue === 0) {\n        this.__impliedStep = 1; // What are\n        we, psychics?\n      } else {\n        // Hey Doug, check this out.\n        this.__impliedStep = Math.pow(10,\n        Math.floor(Math.log(Math.abs(this.initialValue)) / Math.LN10)) / 10;\n      }\n    } else {\n      this.__impliedStep =\n      this.__step;\n    }\n\n    this.__precision = numDecimals(this.__impliedStep);\n  }\n\n  setValue(v) {\n    let _v =\n    v;\n\n    if (this.__min !== undefined && _v < this.__min) {\n      _v = this.__min;\n    } else if (this.__max !==\n    undefined && _v > this.__max) {\n      _v = this.__max;\n    }\n\n    if (this.__step !== undefined && _v %\n    this.__step !== 0) {\n      _v = Math.round(_v / this.__step) * this.__step;\n    }\n\n    return super.setValue(_v);\n  }\n\n  /**\n * Specify a minimum value for <code>object[property]</code>.\n *\n * @param {Number}\n * minValue The minimum value for\n * <code>object[property]</code>\n *\n * @returns\n * {dat.controllers.NumberController} this\n *\n * ^\n * min(minValue) {\n *   this.__min = minValue;\n *   return this;\n * }\n\n  /**\n * Specify a maximum value for <code>object[property]</code>.\n *\n * @param {Number}\n * maxValue The maximum value for\n * <code>object[property]</code>\n *\n * @returns\n * {dat.controllers.NumberController} this\n *\n * ^\n * max(maxValue) {\n *   this.__max = maxValue;\n *   return this;\n * }\n\n  /**\n * Specify a step value that dat.controllers.NumberController\n * increments by.\n *\n * @param\n * {Number} stepValue The step value for\n * dat.controllers.NumberController\n *\n * @default if minimum and\n * maximum specified increment is 1% of the\n * difference otherwise stepValue is 1\n *\n * @returns\n * {dat.controllers.NumberController} this\n *\n * ^\n * step(stepValue) {\n *   this.__step = stepValue;\n *   this.__impliedStep = stepValue;\n *   this.__precision = numDecimals(stepValue);\n *   return this;\n * }\n\n\nexport\n * default NumberController;\n", /**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version\n * 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a\n * copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n\nimport NumberController from\n'./NumberController';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\nfunction

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roundToDecimal(value, decimals) {\n  const tenTo = Math.pow(10, decimals);\n  return Math.round(value * tenTo)
/ tenTo;\n}\n\n/**\n * @class Represents a given property of an object that is a number and\n * provides an input
element with which to manipulate it.\n *\n * @extends dat.controllers.Controller\n *\n * @extends
dat.controllers.NumberController\n *\n * @param {Object} object The object to be manipulated\n *\n * @param
{string} property The name of the property to be manipulated\n *\n * @param {Object} [params] Optional parameters\n
*\n * @param {Number} [params.min] Minimum allowed value\n *\n * @param {Number} [params.max] Maximum
allowed value\n *\n * @param {Number} [params.step] Increment by which to change value\n */\n\nclass
NumberControllerBox extends NumberController {\n  constructor(object, property, params) {\n    super(object,
property, params);\n\n    this.__truncationSuspended = false;\n\n    const _this = this;\n\n    /**\n     * {Number}
Previous mouse y position\n     *\n     * @ignore\n     */\n    let prevY;\n\n    function onChange() {\n      const attempted =
parseFloat(_this.__input.value);\n      if (!common.isNaN(attempted)) {\n        _this.setValue(attempted);\n      }\n
}\n\n    function onFinish() {\n      if (_this.__onFinishChange) {\n        _this.__onFinishChange.call(_this,
_this.getValue());\n      }\n    }\n\n    function onBlur() {\n      onFinish();\n    }\n\n    function onMouseDrag(e) {\n
const diff = prevY - e.clientY;\n      _this.setValue(_this.getValue() + diff * _this.__impliedStep);\n      prevY =
e.clientY;\n    }\n\n    function onMouseUp() {\n      dom.unbind(window, 'mousemove', onMouseDrag);\n      dom.unbind(window, 'mouseup', onMouseUp);\n      onFinish();\n    }\n\n    function onMouseDown(e) {\n
dom.bind(window, 'mousemove', onMouseDrag);\n      dom.bind(window, 'mouseup', onMouseUp);\n      prevY =
e.clientY;\n    }\n\n    this.__input = document.createElement('input');\n    this.__input.setAttribute('type', 'text');\n\n    // Makes it so manually specified values are not truncated.\n    dom.bind(this.__input, 'change', onChange);\n    dom.bind(this.__input, 'blur', onBlur);\n    dom.bind(this.__input, 'mousedown', onMouseDown);\n    dom.bind(this.__input, 'keydown', function(e) {\n      // When pressing enter, you can be as precise as you want.\n      if (e.keyCode === 13) {\n        _this.__truncationSuspended = true;\n        this.blur();\n        _this.__truncationSuspended = false;\n        onFinish();\n      }\n    });\n\n    this.updateDisplay();\n\n    this.domElement.appendChild(this.__input);\n  }\n\n  updateDisplay() {\n    this.__input.value =
this.__truncationSuspended ? this.getValue() : roundToDecimal(this.getValue(), this.__precision);\n    return
super.updateDisplay();\n  }\n}\n\nexport default NumberControllerBox;\n\n"/**\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * \n *
Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * \n *
http://www.apache.org/licenses/LICENSE-2.0\n * \n */\nimport NumberController from './NumberController';\nimport
dom from './dom/dom';\n\nfunction map(v, i1, i2, o1, o2) {\n  return o1 + (o2 - o1) * ((v - i1) / (i2 - i1));\n}\n\n/**\n
 * @class Represents a given property of an object that is a number, contains\n * a minimum and maximum, and
provides a slider element with which to\n * manipulate it. It should be noted that the slider element is made up of\n
* <code>&lt;div&gt;</code> tags, <strong>not</strong> the html5\n * <code>&lt;slider&gt;</code> element.\n *\n
* @extends dat.controllers.Controller\n *\n * @extends dat.controllers.NumberController\n *\n * @param {Object}
object The object to be manipulated\n *\n * @param {string} property The name of the property to be manipulated\n
*\n * @param {Number} minValue Minimum allowed value\n *\n * @param {Number} maxValue Maximum allowed
value\n *\n * @param {Number} stepValue Increment by which to change value\n */\n\nclass NumberControllerSlider
extends NumberController {\n  constructor(object, property, min, max, step) {\n    super(object, property, { min:
min, max: max, step: step });\n\n    const _this = this;\n\n    this.__background = document.createElement('div');\n
this.__foreground = document.createElement('div');\n\n    dom.bind(this.__background, 'mousedown',
onMouseDown);\n    dom.bind(this.__background, 'touchstart', onTouchStart);\n\n    dom.addClass(this.__background, 'slider');\n    dom.addClass(this.__foreground, 'slider-fg');\n\n    function
onMouseDown(e) {\n      document.activeElement.blur();\n      dom.bind(window, 'mousemove', onMouseDrag);\n      dom.bind(window, 'mouseup', onMouseUp);\n      onMouseDrag(e);\n    }\n\n    function onMouseDrag(e) {\n
e.preventDefault();\n\n      const bgRect = _this.__background.getBoundingClientRect();\n      _this.setValue(\n
map(e.clientX, bgRect.left, bgRect.right, _this.__min, _this.__max)\n      );\n\n      return false;\n    }\n\n    function
onMouseUp() {\n      dom.unbind(window, 'mousemove', onMouseDrag);\n      dom.unbind(window, 'mouseup',

```

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onMouseUp);
    if (_this.__onFinishChange) {
        _this.__onFinishChange.call(_this, _this.getValue());
    }
}

function onTouchStart(e) {
    if (e.touches.length !== 1) {
        return;
    }
    dom.bind(window, 'touchmove', onTouchMove);
    dom.bind(window, 'touchend', onTouchEnd);
    onTouchMove(e);
}

function onTouchMove(e) {
    const clientX = e.touches[0].clientX;
    const bgRect = _this.__background.getBoundingClientRect();
    _this.setValue(map(clientX, bgRect.left, bgRect.right, _this.__min, _this.__max));
}

function onTouchEnd() {
    dom.unbind(window, 'touchmove', onTouchMove);
    dom.unbind(window, 'touchend', onTouchEnd);
    if (_this.__onFinishChange) {
        _this.__onFinishChange.call(_this, _this.getValue());
    }
}

this.updateDisplay();
this.__background.appendChild(this.__foreground);
this.domElement.appendChild(this.__background);
updateDisplay() {
    const pct = (this.getValue() - this.__min) / (this.__max - this.__min);
    this.__foreground.style.width = pct * 100 + '%';
    return super.updateDisplay();
}

export default NumberControllerSlider;
", /**
 * dat-gui JavaScript Controller Library
 * http://code.google.com/p/dat-gui
 * Copyright 2011 Data Arts Team, Google Creative Lab
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 */
import Controller from './Controller';
import dom from './dom/dom';
/**
 * @class Provides a GUI interface to fire a specified method, a property of an object.
 * @extends dat.controllers.Controller
 * @param {Object} object The object to be manipulated
 * @param {string} property The name of the property to be manipulated
 */
class FunctionController extends Controller {
    constructor(object, property, text) {
        super(object, property);
    }
    const _this = this;
    this.__button = document.createElement('div');
    this.__button.innerHTML = text === undefined ? 'Fire' : text;
    dom.bind(this.__button, 'click', function(e) {
        e.preventDefault();
        _this.fire();
        return false;
    });
    dom.addClass(this.__button, 'button');
    this.domElement.appendChild(this.__button);
}

fire() {
    if (this.__onChange) {
        this.__onChange.call(this);
    }
    this.getValue().call(this.object);
    if (this.__onFinishChange) {
        this.__onFinishChange.call(this, this.getValue());
    }
}

export default FunctionController;
", /**
 * dat-gui JavaScript Controller Library
 * http://code.google.com/p/dat-gui
 * Copyright 2011 Data Arts Team, Google Creative Lab
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 * http://www.apache.org/licenses/LICENSE-2.0
 */
import Controller from './Controller';
import dom from './dom/dom';
import Color from './color/Color';
import interpret from './color/interpret';
import common from './utils/common';
/**
 * @class Represents a given property of an object that is a color.
 * @param {Object} object
 * @param {string} property
 */
class ColorController extends Controller {
    constructor(object, property) {
        super(object, property);
    }
    this.__color = new Color(this.getValue());
    this.__temp = new Color(0);
    const _this = this;
    this.domElement = document.createElement('div');
    dom.makeSelectable(this.domElement, false);
    this.__selector = document.createElement('div');
    this.__selector.className = 'selector';
    this.__saturation_field = document.createElement('div');
    this.__saturation_field.className = 'saturation-field';
    this.__field_knob = document.createElement('div');
    this.__field_knob.className = 'field-knob';
    this.__field_knob_border = '2px solid';
    this.__hue_knob = document.createElement('div');
    this.__hue_knob.className = 'hue-knob';
    this.__hue_field = document.createElement('div');
    this.__hue_field.className = 'hue-field';
    this.__input = document.createElement('input');
    this.__input.type = 'text';
    this.__input_textShadow = '0 1px 1px';
    dom.bind(this.__input, 'keydown', function(e) {
        if (e.keyCode === 13) {
            // on enter
            onBlur.call(this);
        }
    });
    dom.bind(this.__input, 'blur', onBlur);
    dom.bind(this.__selector, 'mousedown', function(* e *) {
        dom
            .addClass(this, 'drag')
            .bind(window, 'mouseup', function(* e *) {
                dom.removeClass(_this.__selector, 'drag');
            });
    });
    dom.bind(this.__selector, 'touchstart', function(* e *) {
        dom
            .addClass(this, 'drag')
            .bind(window, 'touchend', function(* e *) {
                dom.removeClass(_this.__selector, 'drag');
            });
    });
    const valueField = document.createElement('div');
    common.extend(this.__selector.style, {
        width: '122px',
        height:

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'102px',\n  padding: '3px',\n  backgroundColor: '#222',\n  boxShadow: '0px 1px 3px rgba(0,0,0,0.3)\n
});\n\n common.extend(this.__field_knob.style, {\n  position: 'absolute',\n  width: '12px',\n  height:
'12px',\n  border: this.__field_knob_border + (this.__color.v < 0.5 ? '#fff' : '#000'),\n  boxShadow: '0px 1px 3px
rgba(0,0,0,0.5)',\n  borderRadius: '12px',\n  zIndex: 1\n });\n\n common.extend(this.__hue_knob.style, {\n
position: 'absolute',\n  width: '15px',\n  height: '2px',\n  borderRight: '4px solid #fff',\n  zIndex: 1\n
});\n\n common.extend(this.__saturation_field.style, {\n  width: '100px',\n  height: '100px',\n  border: '1px
solid #555',\n  marginRight: '3px',\n  display: 'inline-block',\n  cursor: 'pointer'\n });\n\n
common.extend(valueField.style, {\n  width: '100%',\n  height: '100%',\n  background: 'none'\n });\n\n
linearGradient(valueField, 'top', 'rgba(0,0,0,0)', '#000');\n\n common.extend(this.__hue_field.style, {\n  width:
'15px',\n  height: '100px',\n  border: '1px solid #555',\n  cursor: 'ns-resize',\n  position: 'absolute',\n  top:
'3px',\n  right: '3px'\n });\n\n hueGradient(this.__hue_field);\n\n common.extend(this.__input.style, {\n
outline: 'none',\n// width: '120px',\n  textAlign: 'center',\n// padding: '4px',\n// marginBottom: '6px',\n
color: '#fff',\n  border: 0,\n  fontWeight: 'bold',\n  textShadow: this.__input_textShadow + 'rgba(0,0,0,0.7)\n
});\n\n dom.bind(this.__saturation_field, 'mousedown', fieldDown);\n dom.bind(this.__saturation_field,
'touchstart', fieldDown);\n\n dom.bind(this.__field_knob, 'mousedown', fieldDown);\n
dom.bind(this.__field_knob, 'touchstart', fieldDown);\n\n dom.bind(this.__hue_field, 'mousedown',
fieldDownH);\n dom.bind(this.__hue_field, 'touchstart', fieldDownH);\n\n function fieldDown(e) {\n
setSV(e);\n  dom.bind(window, 'mousemove', setSV);\n  dom.bind(window, 'touchmove', setSV);\n
dom.bind(window, 'mouseup', fieldUpSV);\n  dom.bind(window, 'touchend', fieldUpSV);\n  }\n\n function
fieldDownH(e) {\n  setH(e);\n  dom.bind(window, 'mousemove', setH);\n  dom.bind(window, 'touchmove',
setH);\n  dom.bind(window, 'mouseup', fieldUpH);\n  dom.bind(window, 'touchend', fieldUpH);\n  }\n\n
function fieldUpSV() {\n  dom.unbind(window, 'mousemove', setSV);\n  dom.unbind(window, 'touchmove',
setSV);\n  dom.unbind(window, 'mouseup', fieldUpSV);\n  dom.unbind(window, 'touchend', fieldUpSV);\n
onFinish();\n  }\n\n function fieldUpH() {\n  dom.unbind(window, 'mousemove', setH);\n
dom.unbind(window, 'touchmove', setH);\n  dom.unbind(window, 'mouseup', fieldUpH);\n
dom.unbind(window, 'touchend', fieldUpH);\n  onFinish();\n  }\n\n function onBlur() {\n  const i =
interpret(this.value);\n  if (i !== false) {\n    _this.__color.__state = i;\n
_this.setValue(_this.__color.toOriginal());\n  } else {\n    this.value = _this.__color.toString();\n  }\n  }\n\n
function onFinish() {\n  if (_this.__onFinishChange) {\n    _this.__onFinishChange.call(_this,
_this.__color.toOriginal());\n  }\n  }\n\n this.__saturation_field.appendChild(valueField);\n
this.__selector.appendChild(this.__field_knob);\n this.__selector.appendChild(this.__saturation_field);\n
this.__selector.appendChild(this.__hue_field);\n this.__hue_field.appendChild(this.__hue_knob);\n\n
this.domElement.appendChild(this.__input);\n this.domElement.appendChild(this.__selector);\n\n
this.updateDisplay();\n\n function setSV(e) {\n  if (e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n
const fieldRect = _this.__saturation_field.getBoundingClientRect();\n  const { clientX, clientY } = (e.touches &&
e.touches[0]) || e;\n  let s = (clientX - fieldRect.left) / (fieldRect.right - fieldRect.left);\n  let v = 1 - (clientY -
fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n  if (v > 1) {\n    v = 1;\n  } else if (v < 0) {\n    v =
0;\n  }\n\n  if (s > 1) {\n    s = 1;\n  } else if (s < 0) {\n    s = 0;\n  }\n\n  _this.__color.v = v;\n
_this.__color.s = s;\n\n  _this.setValue(_this.__color.toOriginal());\n\n  return false;\n  }\n\n function
setH(e) {\n  if (e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n  const fieldRect =
_this.__hue_field.getBoundingClientRect();\n  const { clientY } = (e.touches && e.touches[0]) || e;\n  let h = 1 -
(clientY - fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n  if (h > 1) {\n    h = 1;\n  } else if (h < 0)
{\n    h = 0;\n  }\n\n  _this.__color.h = h * 360;\n\n  _this.setValue(_this.__color.toOriginal());\n\n
return false;\n  }\n  }\n\n updateDisplay() {\n  const i = interpret(this.getValue());\n\n  if (i !== false) {\n    let
mismatch = false;\n\n    // Check for mismatch on the interpreted value.\n\n    common.each(Color.COMPONENTS, function(component) {\n      if (!common.isUndefined(i[component]) &&
!common.isUndefined(this.__color.__state[component]) &&\n        i[component] !==
this.__color.__state[component]) {\n        mismatch = true;\n        return {}; // break\n      }\n    }, this);\n\n    //

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property, arguments[2]);\n }\n\n // Providing a map?\n if (common.isNumber(initialValue)) {\n // Has min and
max? (slider)\n if (common.isNumber(arguments[2]) && common.isNumber(arguments[3])) {\n // has step?\n
if (common.isNumber(arguments[4])) {\n return new NumberControllerSlider(object, property,\n
arguments[2], arguments[3], arguments[4]);\n }\n\n return new NumberControllerSlider(object, property,
arguments[2], arguments[3]);\n }\n\n // number box\n if (common.isNumber(arguments[4])) { // has step\n
return new NumberControllerBox(object, property,\n { min: arguments[2], max: arguments[3], step:
arguments[4] });\n }\n\n return new NumberControllerBox(object, property, { min: arguments[2], max:
arguments[3] });\n }\n\n if (common.isString(initialValue)) {\n return new StringController(object, property);\n
}\n\n if (common.isFunction(initialValue)) {\n return new FunctionController(object, property, "");\n }\n\n if
(common.isBoolean(initialValue)) {\n return new BooleanController(object, property);\n }\n\n return
null;\n};\n\nexport default ControllerFactory;\n", "/*\n * dat-gui JavaScript Controller Library\n *
http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nfunction requestAnimationFrame(callback) {\n setTimeout(callback, 1000 / 60);\n}\n\nexport default
window.requestAnimationFrame ||\n window.webkitRequestAnimationFrame ||\n
window.mozRequestAnimationFrame ||\n window.oRequestAnimationFrame ||\n
window.msRequestAnimationFrame ||\n requestAnimationFrame;\n", "/*\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n * Copyright 2011 Data Arts Team, Google Creative Lab\n * Licensed
under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n * http://www.apache.org/licenses/LICENSE-2.0\n
*/\n\nimport dom from './dom/dom';\nimport common from
'./utils/common';\n\nclass CenteredDiv {\n constructor() {\n this.backgroundElement =
document.createElement('div');\n common.extend(this.backgroundElement.style, {\n backgroundColor:
'rgba(0,0,0,0.8)',\n top: 0,\n left: 0,\n display: 'none',\n zIndex: '1000',\n opacity: 0,\n
WebkitTransition: 'opacity 0.2s linear',\n transition: 'opacity 0.2s linear'\n });\n\n
dom.makeFullscreen(this.backgroundElement);\n this.backgroundElement.style.position = 'fixed';\n\n
this.domElement = document.createElement('div');\n common.extend(this.domElement.style, {\n position:
'fixed',\n display: 'none',\n zIndex: '1001',\n opacity: 0,\n WebkitTransition: '-webkit-transform 0.2s
ease-out, opacity 0.2s linear',\n transition: 'transform 0.2s ease-out, opacity 0.2s linear'\n });\n\n
document.body.appendChild(this.backgroundElement);\n document.body.appendChild(this.domElement);\n\n
const _this = this;\n dom.bind(this.backgroundElement, 'click', function() {\n _this.hide();\n });\n }\n\n
show() {\n const _this = this;\n\n this.backgroundElement.style.display = 'block';\n\n
this.domElement.style.display = 'block';\n this.domElement.style.opacity = 0;\n// this.domElement.style.top =
'52%';\n this.domElement.style.webkitTransform = 'scale(1.1)';\n\n this.layout();\n\n common.defer(function()
{\n _this.backgroundElement.style.opacity = 1;\n _this.domElement.style.opacity = 1;\n
_this.domElement.style.webkitTransform = 'scale(1)';\n });\n }\n\n /**\n * Hide centered div\n */\n hide() {\n
const _this = this;\n\n const hide = function() {\n _this.domElement.style.display = 'none';\n
_this.backgroundElement.style.display = 'none';\n\n dom.unbind(_this.domElement, 'webkitTransitionEnd',
hide);\n dom.unbind(_this.domElement, 'transitionend', hide);\n dom.unbind(_this.domElement,
'oTransitionEnd', hide);\n\n };;\n\n dom.bind(this.domElement, 'webkitTransitionEnd', hide);\n
dom.bind(this.domElement, 'transitionend', hide);\n dom.bind(this.domElement, 'oTransitionEnd', hide);\n\n
this.backgroundElement.style.opacity = 0;\n// this.domElement.style.top = '48%';\n
this.domElement.style.opacity = 0;\n this.domElement.style.webkitTransform = 'scale(1.1)';\n }\n\n layout() {\n
this.domElement.style.left = window.innerWidth / 2 - dom.getWidth(this.domElement) / 2 + 'px';\n
this.domElement.style.top = window.innerHeight / 2 - dom.getHeight(this.domElement) / 2 + 'px';\n }\n}\n\nexport
default CenteredDiv;\n", "/*\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport css from './utils/css';\nimport
saveDialogContents from './saveDialog.html';\nimport ControllerFactory from
 './controllers/ControllerFactory';\nimport Controller from './controllers/Controller';\nimport BooleanController
from './controllers/BooleanController';\nimport FunctionController from './controllers/FunctionController';\nimport
NumberControllerBox from './controllers/NumberControllerBox';\nimport NumberControllerSlider from
 './controllers/NumberControllerSlider';\nimport ColorController from './controllers/ColorController';\nimport
requestAnimationFrame from './utils/requestAnimationFrame';\nimport CenteredDiv from
 './dom/CenteredDiv';\nimport dom from './dom/dom';\nimport common from './utils/common';\n\nimport
styleSheet from './style.scss'; // CSS to embed in build\n\nccss.inject(styleSheet);\n\n/** @ignore Outer-most
className for GUI's */\n\nconst CSS_NAMESPACE = 'dg';\n\nconst HIDE_KEY_CODE = 72;\n\n/** @ignore The
only value shared between the JS and SCSS. Use caution. */\n\nconst CLOSE_BUTTON_HEIGHT = 20;\n\nconst
DEFAULT_DEFAULT_PRESET_NAME = 'Default';\n\nconst SUPPORTS_LOCAL_STORAGE = (function() {\n
try {\n return !!window.localStorage;\n } catch (e) {\n return false;\n }\n})();\n\nlet
SAVE_DIALOGUE;\n\n/** @ignore Have we yet to create an autoPlace GUI? */\n\nlet autoPlaceVirgin =
true;\n\n/** @ignore Fixed position div that auto place GUI's go inside */\n\nlet autoPlaceContainer;\n\n/** @ignore
Are we hiding the GUI's ? */\n\nlet hide = false;\n\n/** @private GUI's which should be hidden */\n\nconst
hideableGuis = [];\n\n/**\n * @class A lightweight controller library for JavaScript. It allows you to easily\n *
manipulate variables and fire functions on the fly.\n * \n * @typicalname gui\n * \n * @example\n * // Creating a
GUI with options.\n * var gui = new dat.GUI({name: 'My GUI'});\n * \n * @example\n * // Creating a GUI and
a subfolder.\n * var gui = new dat.GUI();\n * var folder1 = gui.addFolder('Flow Field');\n * \n * @param {Object}
[params]\n * @param {String} [params.name] The name of this GUI.\n * @param {Object} [params.load] JSON
object representing the saved state of\n * this GUI.\n * @param {dat.gui.GUI} [params.parent] The GUI I'm nested
in.\n * @param {Boolean} [params.autoPlace=true] \n * @param {Boolean} [params.hideable=true] If true, GUI is
shown/hidden by <kbd>h</kbd> keypress.\n * @param {Boolean} [params.closed=false] If true, starts closed\n *
@param {Boolean} [params.closeOnTop=false] If true, close/open button shows on top of the GUI\n * \n\nconst GUI
= function(pars) {\n const _this = this;\n let params = pars || {};\n\n /**\n * Outermost DOM Element\n *
@type {DOMELEMENT}\n * \n\n this.domElement = document.createElement('div');\n this.__ul =
document.createElement('ul');\n this.domElement.appendChild(this.__ul);\n dom.addClass(this.domElement,
CSS_NAMESPACE);\n\n /**\n * Nested GUI's by name\n * @ignore\n * \n\n this.__folders = {};\n\n
this.__controllers = [];\n\n /**\n * List of objects I'm remembering for save, only used in top level GUI\n *
@ignore\n * \n\n this.__rememberedObjects = [];\n\n /**\n * Maps the index of remembered objects to a map of
controllers, only used\n * in top level GUI.\n * \n * @private\n * @ignore\n * \n * @example\n * [\n * {\n
* propertyName: Controller,\n * anotherPropertyName: Controller\n * },\n * {\n * propertyName:
Controller\n * }\n * ]\n * \n\n this.__rememberedObjectIndecesToControllers = [];\n\n this.__listening = [];\n\n
// Default parameters\n params = common.defaults(params, {\n closeOnTop: false,\n autoPlace: true,\n width:
GUI.DEFAULT_WIDTH\n });\n\n params = common.defaults(params, {\n resizable: params.autoPlace,\n
hideable: params.autoPlace\n });\n\n if (!common.isUndefined(params.load)) {\n // Explicit preset\n if
(params.preset) {\n params.load.preset = params.preset;\n }\n } else {\n params.load = { preset:
DEFAULT_DEFAULT_PRESET_NAME };\n }\n\n if (common.isUndefined(params.parent) &&
params.hideable) {\n hideableGuis.push(this);\n }\n\n // Only root level GUI's are resizable.\n params.resizable =
common.isUndefined(params.parent) && params.resizable;\n\n if (params.autoPlace &&
common.isUndefined(params.scrollable)) {\n params.scrollable = true;\n }\n\n // params.scrollable =
common.isUndefined(params.parent) && params.scrollable === true;\n\n // Not part of params because I don't
want people passing this in via\n // constructor. Should be a 'remembered' value.\n let useLocalStorage =\n SUPPORTS_LOCAL_STORAGE &&\n localStorage.getItem(getLocalStorageHash(this, 'isLocal')) ===
'true';\n\n let saveToLocalStorage;\n let titleRow;\n\n Object.defineProperties(this, {\n /** @lends GUI.prototype
*/\n\n /**\n * The parent <code>GUI</code>\n * @type dat.gui.GUI\n * \n\n parent: {\n

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get: function() {\n    return params.parent;\n    }\n  },\n\n  scrollable: {\n    get: function() {\n    return params.scrollable;\n    }\n  },\n\n  /**\n   * Handles <code>GUI</code>'s element placement for you\n   * @type Boolean\n   */\n  autoPlace: {\n    get: function() {\n    return params.autoPlace;\n    }\n  },\n\n  /**\n   * Handles <code>GUI</code>'s position of open/close button\n   * @type Boolean\n   */\n  closeOnTop: {\n    get: function() {\n    return params.closeOnTop;\n    }\n  },\n\n  /**\n   * The identifier for a set of saved values\n   * @type String\n   */\n  preset: {\n    get: function() {\n    if (_this.parent) {\n    return _this.getRoot().preset;\n    }\n    return params.load.preset;\n    },\n\n    set: function(v) {\n    if (_this.parent) {\n    _this.getRoot().preset = v;\n    } else {\n    params.load.preset = v;\n    }\n    setPresetSelectIndex(this);\n    _this.revert();\n    }\n  },\n\n  /**\n   * The width of <code>GUI</code> element\n   * @type Number\n   */\n  width: {\n    get: function() {\n    return params.width;\n    },\n\n    set: function(v) {\n    params.width = v;\n    }\n  },\n\n  /**\n   * The name of <code>GUI</code>. Used for folders. i.e\n   * a folder's name\n   * @type String\n   */\n  name: {\n    get: function() {\n    return params.name;\n    },\n\n    set: function(v) {\n    // TODO Check for collisions among sibling folders\n    params.name = v;\n    if (titleRow) {\n    titleRow.innerHTML = params.name;\n    }\n    },\n\n    /**\n     * Whether the <code>GUI</code> is collapsed or not\n     * @type Boolean\n     */\n    closed: {\n    get: function() {\n    return params.closed;\n    },\n\n    set: function(v) {\n    params.closed = v;\n    if (params.closed) {\n    dom.addClass(_this.__ul, GUI.CLASS_CLOSED);\n    } else {\n    dom.removeClass(_this.__ul, GUI.CLASS_CLOSED);\n    }\n    // For browsers that aren't going to respect the CSS transition,\n    // Lets just check our height against the window height right off\n    // the bat.\n    this.onResize();\n\n    if (_this.__closeButton) {\n    _this.__closeButton.innerHTML = v ? GUI.TEXT_OPEN : GUI.TEXT_CLOSED;\n    }\n    },\n\n    /**\n     * Contains all presets\n     * @type Object\n     */\n    load: {\n    get: function() {\n    return params.load;\n    }\n  },\n\n  /**\n   * Determines whether or not to use <a href="https://developer.mozilla.org/en/DOM/Storage#localStorage">localStorage</a> as the means for\n   * <code>remember</code>ing\n   * @type Boolean\n   */\n  useLocalStorage: {\n    get: function() {\n    return useLocalStorage;\n    },\n\n    set: function(bool) {\n    if (SUPPORTS_LOCAL_STORAGE) {\n    useLocalStorage = bool;\n    if (bool) {\n    dom.bind(window, 'unload', saveToLocalStorage);\n    } else {\n    dom.unbind(window, 'unload', saveToLocalStorage);\n    }\n    localStorage.setItem(getLocalStorageHash(_this, 'isLocal'), bool);\n    }\n    }\n  },\n\n  // Are we a root level GUI?\n  if (common.isUndefined(params.parent)) {\n    this.closed = params.closed || false;\n    dom.addClass(this.domElement, GUI.CLASS_MAIN);\n    dom.makeSelectable(this.domElement, false);\n\n    // Are we supposed to be loading locally?\n    if (SUPPORTS_LOCAL_STORAGE) {\n    if (useLocalStorage) {\n    _this.useLocalStorage = true;\n\n    const savedGui = localStorage.getItem(getLocalStorageHash(this, 'gui'));\n    if (savedGui) {\n    params.load = JSON.parse(savedGui);\n    }\n    }\n\n    this.__closeButton = document.createElement('div');\n    this.__closeButton.innerHTML = GUI.TEXT_CLOSED;\n    dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_BUTTON);\n    if (params.closeOnTop) {\n    dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_TOP);\n    this.domElement.insertBefore(this.__closeButton, this.domElement.childNodes[0]);\n    } else {\n    dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_BOTTOM);\n    this.domElement.appendChild(this.__closeButton);\n    }\n\n    dom.bind(this.__closeButton, 'click', function() {\n    _this.closed = !_this.closed;\n    });\n\n    // Oh, you're a nested GUI!\n  } else {\n    if (params.closed === undefined) {\n    params.closed = true;\n    }\n\n    const titleRowName = document.createTextNode(params.name);\n    dom.addClass(titleRowName, 'controller-name');\n\n    titleRow = addRow(_this, titleRowName);\n\n    const onClickTitle = function(e) {\n    e.preventDefault();\n    _this.closed = !_this.closed;\n    return false;\n    };\n\n    dom.addClass(this.__ul, GUI.CLASS_CLOSED);\n\n    dom.addClass(titleRow, 'title');\n    dom.bind(titleRow, 'click', onClickTitle);\n\n    if (!params.closed) {\n    this.closed = false;\n    }\n  }\n\n  if (params.autoPlace) {\n    if (common.isUndefined(params.parent)) {\n    if (autoPlaceVirgin) {\n    autoPlaceContainer = document.createElement('div');\n
```

```

dom.addClass(autoPlaceContainer, CSS_NAMESPACE);\n    dom.addClass(autoPlaceContainer,
GUI.CLASS_AUTO_PLACE_CONTAINER);\n    document.body.appendChild(autoPlaceContainer);\n
autoPlaceVirgin = false;\n    }\n\n    // Put it in the dom for you.\n
autoPlaceContainer.appendChild(this.domElement);\n\n    // Apply the auto styles\n
dom.addClass(this.domElement, GUI.CLASS_AUTO_PLACE);\n    }\n\n\n    // Make it not elastic.\n    if
(!this.parent) {\n        setWidth(_this, params.width);\n    }\n    }\n\n    this.__resizeHandler = function() {\n
    _this.onResizeDebounce();\n    };\n\n    dom.bind(window, 'resize', this.__resizeHandler);\n    dom.bind(this.__ul,
'webkitTransitionEnd', this.__resizeHandler);\n    dom.bind(this.__ul, 'transitionend', this.__resizeHandler);\n
dom.bind(this.__ul, 'oTransitionEnd', this.__resizeHandler);\n    this.onResize();\n\n    if (params.resizable) {\n
addResizeHandle(this);\n    }\n\n    saveToLocalStorage = function() {\n        if (SUPPORTS_LOCAL_STORAGE &&
localStorage.getItem(getLocalStorageHash(_this, 'isLocal')) === 'true') {\n
localStorage.setItem(getLocalStorageHash(_this, 'gui'), JSON.stringify(_this.getSaveObject()));\n        }\n    };\n\n    //
expose this method publicly\n    this.saveToLocalStorageIfPossible = saveToLocalStorage;\n\n    function resetWidth()\n    {\n        const root = _this.getRoot();\n        root.width += 1;\n        common.defer(function() {\n            root.width -= 1;\n
        });\n    }\n\n    if (!params.parent) {\n        resetWidth();\n    }\n    }\n\n    GUI.toggleHide = function() {\n        hide = !hide;\n
common.each(hideableGuis, function(gui) {\n            gui.domElement.style.display = hide ? 'none' : '';\n
        });\n    }\n\n    GUI.CLASS_AUTO_PLACE = 'a';\n    GUI.CLASS_AUTO_PLACE_CONTAINER =
'ac';\n    GUI.CLASS_MAIN = 'main';\n    GUI.CLASS_CONTROLLER_ROW = 'cr';\n    GUI.CLASS_TOO_TALL =
'taller-than-window';\n    GUI.CLASS_CLOSED = 'closed';\n    GUI.CLASS_CLOSE_BUTTON = 'close-
button';\n    GUI.CLASS_CLOSE_TOP = 'close-top';\n    GUI.CLASS_CLOSE_BOTTOM = 'close-
bottom';\n    GUI.CLASS_DRAG = 'drag';\n\n    GUI.DEFAULT_WIDTH = 245;\n    GUI.TEXT_CLOSED = 'Close
Controls';\n    GUI.TEXT_OPEN = 'Open Controls';\n\n    GUI._keydownHandler = function(e) {\n        if
(document.activeElement.type !== 'text' &&\n        (e.which === HIDE_KEY_CODE || e.keyCode ===
HIDE_KEY_CODE)) {\n            GUI.toggleHide();\n        }\n    };\n\n    dom.bind(window, 'keydown', GUI._keydownHandler,
false);\n\n    common.extend(\n        GUI.prototype,\n        /** @lends GUI.prototype */\n        {\n\n            /**\n             * Adds a new
{@link Controller} to the GUI. The type of controller created\n             * is inferred from the initial value of
<code>object[property]</code>. For\n             * color properties, see {@link addColor}.\n             * @param {Object}
object The object to be manipulated\n             * @param {String} property The name of the property to be manipulated\n
             * @param {Number} [min] Minimum allowed value\n             * @param {Number} [max] Maximum allowed value\n
             * @param {Number} [step] Increment by which to change value\n             * @returns {Controller} The controller that
was added to the GUI.\n             * @instance\n             * @example\n             * // Add a string controller.\n             * var person =
{name: 'Sam'};\n             * gui.add(person, 'name');\n             * @example\n             * // Add a number controller slider.\n             *
var person = {age: 45};\n             * gui.add(person, 'age', 0, 100);\n             * ^\n             * add: function(object, property) {\n
            return\n            add(\n                this,\n                object,\n                property,\n                {\n                    factoryArgs: Array.prototype.slice.call(arguments, 2)\n
                }\n            );\n        },\n\n        /**\n         * Adds a new color controller to the GUI.\n         * @param object\n         *
@param property\n         * @returns {Controller} The controller that was added to the GUI.\n         * @instance\n         *
@example\n         * var palette = {\n         *     color1: '#FF0000', // CSS string\n         *     color2: [ 0, 128, 255 ], // RGB
array\n         *     color3: [ 0, 128, 255, 0.3 ], // RGB with alpha\n         *     color4: { h: 350, s: 0.9, v: 0.3 } // Hue,
saturation, value\n         * };\n         * gui.addColor(palette, 'color1');\n         * gui.addColor(palette, 'color2');\n         *
gui.addColor(palette, 'color3');\n         * gui.addColor(palette, 'color4');\n         * ^\n         * addColor: function(object, property)\n
            {\n                return add(\n                    this,\n                    object,\n                    property,\n                    {\n                        color: true\n                    }\n                );\n            },\n\n        /**\n         * Removes the given controller from the GUI.\n         * @param {Controller} controller\n         * @instance\n
         * ^\n         * remove: function(controller) {\n            // TODO listening?\n            this.__ul.removeChild(controller.__li);\n
            this.__controllers.splice(this.__controllers.indexOf(controller), 1);\n            const _this = this;\n
            common.defer(function() {\n                _this.onResize();\n            });\n        },\n\n        /**\n         * Removes the root GUI from the
document and unbinds all event listeners.\n         * For subfolders, use `gui.removeFolder(folder)` instead.\n         *
@example\n         * ^\n         * destroy: function() {\n            if (this.parent) {\n                throw new Error(\n                    'Only the root GUI
should be removed with .destroy(). ' +\n                    'For subfolders, use gui.removeFolder(folder) instead.\n                );\n            }\n
        }\n    }\n\n    dom.bind(window, 'keydown', GUI._keydownHandler, false);\n\n    common.extend(\n        GUI.prototype,\n        /** @lends GUI.prototype */\n        {\n\n            /**\n             * Adds a new
{@link Controller} to the GUI. The type of controller created\n             * is inferred from the initial value of
<code>object[property]</code>. For\n             * color properties, see {@link addColor}.\n             * @param {Object}
object The object to be manipulated\n             * @param {String} property The name of the property to be manipulated\n
             * @param {Number} [min] Minimum allowed value\n             * @param {Number} [max] Maximum allowed value\n
             * @param {Number} [step] Increment by which to change value\n             * @returns {Controller} The controller that
was added to the GUI.\n             * @instance\n             * @example\n             * // Add a string controller.\n             * var person =
{name: 'Sam'};\n             * gui.add(person, 'name');\n             * @example\n             * // Add a number controller slider.\n             *
var person = {age: 45};\n             * gui.add(person, 'age', 0, 100);\n             * ^\n             * add: function(object, property) {\n
            return\n            add(\n                this,\n                object,\n                property,\n                {\n                    factoryArgs: Array.prototype.slice.call(arguments, 2)\n
                }\n            );\n        },\n\n        /**\n         * Adds a new color controller to the GUI.\n         * @param object\n         *
@param property\n         * @returns {Controller} The controller that was added to the GUI.\n         * @instance\n         *
@example\n         * var palette = {\n         *     color1: '#FF0000', // CSS string\n         *     color2: [ 0, 128, 255 ], // RGB
array\n         *     color3: [ 0, 128, 255, 0.3 ], // RGB with alpha\n         *     color4: { h: 350, s: 0.9, v: 0.3 } // Hue,
saturation, value\n         * };\n         * gui.addColor(palette, 'color1');\n         * gui.addColor(palette, 'color2');\n         *
gui.addColor(palette, 'color3');\n         * gui.addColor(palette, 'color4');\n         * ^\n         * addColor: function(object, property)\n
            {\n                return add(\n                    this,\n                    object,\n                    property,\n                    {\n                        color: true\n                    }\n                );\n            },\n\n        /**\n         * Removes the given controller from the GUI.\n         * @param {Controller} controller\n         * @instance\n
         * ^\n         * remove: function(controller) {\n            // TODO listening?\n            this.__ul.removeChild(controller.__li);\n
            this.__controllers.splice(this.__controllers.indexOf(controller), 1);\n            const _this = this;\n
            common.defer(function() {\n                _this.onResize();\n            });\n        },\n\n        /**\n         * Removes the root GUI from the
document and unbinds all event listeners.\n         * For subfolders, use `gui.removeFolder(folder)` instead.\n         *
@example\n         * ^\n         * destroy: function() {\n            if (this.parent) {\n                throw new Error(\n                    'Only the root GUI
should be removed with .destroy(). ' +\n                    'For subfolders, use gui.removeFolder(folder) instead.\n                );\n            }\n
        }\n    }\n\n    dom.bind(window, 'keydown', GUI._keydownHandler, false);

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}\n\n  if (this.autoPlace) {\n    autoPlaceContainer.removeChild(this.domElement);\n  }\n\n  const _this =
this;\n  common.each(this.__folders, function(subfolder) {\n    _this.removeFolder(subfolder);\n  });\n\n  dom.unbind(window, 'keydown', GUI._keydownHandler, false);\n\n  removeListeners(this);\n  },\n\n  /**\n *
Creates a new subfolder GUI instance.\n * @param name\n * @returns {dat.gui.GUI} The new folder.\n *
@throws {Error} if this GUI already has a folder by the specified\n * name\n * @instance\n */\n
addFolder: function(name) {\n  // We have to prevent collisions on names in order to have a key\n  // by which
to remember saved values\n  if (this.__folders[name] !== undefined) {\n    throw new Error('You already have
a folder in this GUI by the' +\n    ' ' name \'' + name + '\");\n  }\n\n  const newGuiParams = { name: name,
parent: this };\n\n  // We need to pass down the autoPlace trait so that we can\n  // attach event listeners to
open/close folder actions to\n  // ensure that a scrollbar appears if the window is too short.\n
newGuiParams.autoPlace = this.autoPlace;\n\n  // Do we have saved appearance data for this folder?\n  if
(this.load && // Anything loaded?\n  this.load.folders && // Was my parent a dead-end?\n
this.load.folders[name]) { // Did daddy remember me?\n    // Start me closed if I was closed\n
newGuiParams.closed = this.load.folders[name].closed;\n\n  // Pass down the loaded data\n
newGuiParams.load = this.load.folders[name];\n  }\n\n  const gui = new GUI(newGuiParams);\n
this.__folders[name] = gui;\n\n  const li = addRow(this, gui.domElement);\n  dom.addClass(li, 'folder');\n
return gui;\n  },\n\n  /**\n * Removes a subfolder GUI instance.\n * @param {dat.gui.GUI} folder The
folder to remove.\n * @instance\n */\n
removeFolder: function(folder) {\n
this.__ul.removeChild(folder.domElement.parentElement);\n\n  delete this.__folders[folder.name];\n\n  // Do
we have saved appearance data for this folder?\n  if (this.load && // Anything loaded?\n  this.load.folders &&
// Was my parent a dead-end?\n  this.load.folders[folder.name]) {\n    delete this.load.folders[folder.name];\n
  }\n\n  removeListeners(folder);\n\n  const _this = this;\n\n  common.each(folder.__folders,
function(subfolder) {\n    folder.removeFolder(subfolder);\n  });\n\n  common.defer(function() {\n
_this.onResize();\n  });\n  },\n\n  /**\n * Opens the GUI.\n */\n
open: function() {\n    this.closed =
false;\n  },\n\n  /**\n * Closes the GUI.\n */\n
close: function() {\n    this.closed = true;\n  },\n\n  /**\n *
Hides the GUI.\n */\n
hide: function() {\n    this.domElement.style.display = 'none';\n  },\n\n  /**\n *
Shows the GUI.\n */\n
show: function() {\n    this.domElement.style.display = '';\n  },\n\n\n  onResize:
function() {\n    // we debounce this function to prevent performance issues when rotating on tablet/mobile\n
const root = this.getRoot();\n    if (root.scrollable) {\n      const top = dom.getOffset(root.__ul).top;\n      let h =
0;\n\n      common.each(root.__ul.childNodes, function(node) {\n        if (!(root.autoPlace && node ===
root.__save_row)) {\n          h += dom.getHeight(node);\n        }\n      });\n\n      if (window.innerHeight - top -
CLOSE_BUTTON_HEIGHT < h) {\n        dom.addClass(root.domElement, GUI.CLASS_TOO_TALL);\n
root.__ul.style.height = window.innerHeight - top - CLOSE_BUTTON_HEIGHT + 'px';\n      } else {\n
dom.removeClass(root.domElement, GUI.CLASS_TOO_TALL);\n      root.__ul.style.height = 'auto';\n    }\n
  }\n\n  if (root.__resize_handle) {\n    common.defer(function() {\n      root.__resize_handle.style.height =
root.__ul.offsetHeight + 'px';\n    });\n  }\n\n  if (root.__closeButton) {\n    root.__closeButton.style.width
= root.width + 'px';\n  }\n  },\n\n  onResizeDebounce: common.debounce(function() { this.onResize(); },
50),\n\n  /**\n * Mark objects for saving. The order of these objects cannot change as\n * the GUI grows.
When remembering new objects, append them to the end\n * of the list.\n * @param {...Object}
objects\n * @throws {Error} if not called on a top level GUI.\n * @instance\n * @ignore\n */\n
remember: function() {\n    if (common.isUndefined(SAVE_DIALOGUE)) {\n      SAVE_DIALOGUE = new
CenteredDiv();\n      SAVE_DIALOGUE.domElement.innerHTML = saveDialogueContents;\n    }\n\n    if
(this.parent) {\n      throw new Error('You can only call remember on a top level GUI.);\n    }\n\n    const _this =
this;\n\n    common.each(Array.prototype.slice.call(arguments), function(object) {\n      if
(!_this.__rememberedObjects.length === 0) {\n        addSaveMenu(_this);\n      }\n      if
(!_this.__rememberedObjects.indexOf(object) === -1) {\n        _this.__rememberedObjects.push(object);\n      }\n
    });\n\n    if (this.autoPlace) {\n      // Set save row width\n      setWidth(this, this.width);\n    }\n  },\n\n
/**\n * @returns {dat.gui.GUI} the topmost parent GUI of a nested GUI.\n * @instance\n */\n
getRoot:

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function() {\n  let gui = this;\n  while (gui.parent) {\n    gui = gui.parent;\n  }\n  return gui;\n },\n\n /**\n  * @returns {Object} a JSON object representing the current state of\n  * this GUI as well as its\n  remembered properties.\n  * @instance\n  */\n  getSaveObject: function() {\n    const toReturn = this.load;\n    toReturn.closed = this.closed;\n    // Am I remembering any values?\n    if (this.__rememberedObjects.length >\n  0) {\n    toReturn.preset = this.preset;\n    if (!toReturn.remembered) {\n    toReturn.remembered = {};\n    }\n    toReturn.remembered[this.preset] = getCurrentPreset(this);\n    }\n    toReturn.folders = {};\n    common.each(this.__folders, function(element, key) {\n    toReturn.folders[key] = element.getSaveObject();\n    });\n    return toReturn;\n  },\n  save: function() {\n    if (!this.load.remembered) {\n    this.load.remembered = {};\n    }\n    this.load.remembered[this.preset] = getCurrentPreset(this);\n    markPresetModified(this, false);\n    this.saveToLocalStorageIfPossible();\n  },\n  saveAs:\n  function(presetName) {\n    if (!this.load.remembered) {\n    // Retain default values upon first save\n    this.load.remembered = {};\n    this.load.remembered[DEFAULT_DEFAULT_PRESET_NAME] =\n    getCurrentPreset(this, true);\n    }\n    this.load.remembered[presetName] = getCurrentPreset(this);\n    this.preset = presetName;\n    addPresetOption(this, presetName, true);\n    this.saveToLocalStorageIfPossible();\n  },\n  revert: function(gui) {\n    common.each(this.__controllers, function(controller) {\n    // Make revert\n    work on Default.\n    if (!this.getRoot().load.remembered) {\n    controller.setValue(controller.initialValue);\n    } else {\n    recallSavedValue(gui || this.getRoot(), controller);\n    }\n    // fire onFinishChange\n    callback\n    if (controller.__onFinishChange) {\n    controller.__onFinishChange.call(controller,\n    controller.getValue();\n    }, this);\n    }\n    common.each(this.__folders, function(folder) {\n    folder.revert(folder);\n    });\n    if (!gui) {\n    markPresetModified(this.getRoot(), false);\n    },\n  },\n  listen: function(controller) {\n    const init = this.__listening.length === 0;\n    this.__listening.push(controller);\n    if (init) {\n    updateDisplays(this.__listening);\n    },\n  },\n  updateDisplay: function() {\n    common.each(this.__controllers, function(controller) {\n    controller.updateDisplay();\n    });\n    common.each(this.__folders, function(folder) {\n    folder.updateDisplay();\n    });\n  },\n  /**\n  * Add\n  a row to the end of the GUI or before another row.\n  * @param gui\n  * @param [newDom] If specified, inserts\n  the dom content in the new row\n  * @param [liBefore] If specified, places the new row before another row\n  * @\n  * @ignore\n  */\n  function addRow(gui, newDom, liBefore) {\n    const li = document.createElement('li');\n    if\n    (newDom) {\n    li.appendChild(newDom);\n    }\n    if (liBefore) {\n    gui.__ul.insertBefore(li, liBefore);\n    } else\n    {\n    gui.__ul.appendChild(li);\n    }\n    gui.onResize();\n    return li;\n  }\n  function removeListeners(gui) {\n    dom.unbind(window, 'resize', gui.__resizeHandler);\n    if (gui.saveToLocalStorageIfPossible) {\n    dom.unbind(window, 'unload', gui.saveToLocalStorageIfPossible);\n    }\n  }\n  function markPresetModified(gui,\n  modified) {\n    const opt = gui.__preset_select[gui.__preset_select.selectedIndex];\n    if (modified) {\n    opt.innerHTML = opt.value + '*';\n    } else {\n    opt.innerHTML = opt.value;\n    }\n  }\n  function\n  augmentController(gui, li, controller) {\n    controller.__li = li;\n    controller.__gui = gui;\n    common.extend(controller, /** @lends Controller.prototype */ {\n    /**\n    * @param {Array|Object} options\n    * @return {Controller}\n    */\n    options: function(options) {\n    if (arguments.length > 1) {\n    const\n    nextSibling = controller.__li.nextElementSibling;\n    controller.remove();\n    return add(\n    gui,\n    controller.object,\n    controller.property,\n    {\n    before: nextSibling,\n    factoryArgs:\n    [common.toArray(arguments)]\n    },\n    );\n    }\n    if (common.isArray(options) ||\n    common.isObject(options)) {\n    const nextSibling = controller.__li.nextElementSibling;\n    controller.remove();\n    return add(\n    gui,\n    controller.object,\n    controller.property,\n    {\n    before: nextSibling,\n    factoryArgs: [options]\n    },\n    );\n    }\n    },\n    /**\n    * Sets the\n    name of the controller.\n    * @param {string} name\n    * @return {Controller}\n    */\n    name: function(name)\n    {\n    controller.__li.firstChild.firstChild.innerHTML = name;\n    return controller;\n    },\n    /**\n    * Sets controller to listen for changes on its underlying object.\n    * @return {Controller}\n    */\n    listen:\n    function() {\n    controller.__gui.listen(controller);\n    return controller;\n    },\n    /**\n    * Removes the\n    controller from its parent GUI.\n    * @return {Controller}\n    */\n    remove: function() {\n    controller.__gui.remove(controller);\n    return controller;\n    }\n  });\n  // All sliders should be accompanied by a

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box.\n if (controller instanceof NumberControllerSlider) {\n  const box = new
NumberControllerBox(controller.object, controller.property,\n  { min: controller.__min, max: controller.__max,
step: controller.__step });\n\n  common.each(['updateDisplay', 'onChange', 'onFinishChange', 'step', 'min', 'max'],
function(method) {\n  const pc = controller[method];\n  const pb = box[method];\n  controller[method] =
box[method] = function() {\n  const args = Array.prototype.slice.call(arguments);\n  pb.apply(box, args);\n
return pc.apply(controller, args);\n  });\n\n  dom.addClass(li, 'has-slider');\n
controller.domElement.insertBefore(box.domElement, controller.domElement.firstChild);\n } else if
(controller instanceof NumberControllerBox) {\n  const r = function(returned) {\n  // Have we defined both
boundaries?\n  if (common.isNumber(controller.__min) && common.isNumber(controller.__max)) {\n  //
Well, then lets just replace this with a slider.\n\n  // lets remember if the old controller had a specific name or
was listening\n  const oldName = controller.__li.firstChild.firstChild.innerHTML;\n  const
wasListening = controller.__gui.__listening.indexOf(controller) > -1;\n\n  controller.remove();\n  const
newController = add(\n  gui,\n  controller.object,\n  controller.property,\n  {\n  before:
controller.__li.nextElementSibling,\n  factoryArgs: [controller.__min, controller.__max, controller.__step]\n
});\n\n  newController.name(oldName);\n  if (wasListening) newController.listen();\n\n  return
newController;\n  }\n\n  return returned;\n  });\n\n  controller.min = common.compose(r, controller.min);\n
controller.max = common.compose(r, controller.max);\n } else if (controller instanceof BooleanController) {\n
dom.bind(li, 'click', function() {\n  dom.fakeEvent(controller.__checkbox, 'click');\n  });\n\n
dom.bind(controller.__checkbox, 'click', function(e) {\n  e.stopPropagation(); // Prevents double-toggle\n  });\n
} else if (controller instanceof FunctionController) {\n  dom.bind(li, 'click', function() {\n
dom.fakeEvent(controller.__button, 'click');\n  });\n\n  dom.bind(li, 'mouseover', function() {\n
dom.addClass(controller.__button, 'hover');\n  });\n\n  dom.bind(li, 'mouseout', function() {\n
dom.removeClass(controller.__button, 'hover');\n  });\n } else if (controller instanceof ColorController) {\n
dom.addClass(li, 'color');\n  controller.updateDisplay = common.compose(function(val) {\n
li.style.borderColor = controller.__color.toString();\n  return val;\n  }, controller.updateDisplay);\n\n
controller.updateDisplay();\n }\n\n controller.setValue = common.compose(function(val) {\n  if
(gui.getRoot().__preset_select && controller.isModified()) {\n  markPresetModified(gui.getRoot(), true);\n
}\n\n  return val;\n  }, controller.setValue);\n\n\nfunction recallSavedValue(gui, controller) {\n // Find the
topmost GUI, that's where remembered objects live.\n const root = gui.getRoot();\n\n // Does the object we're
controlling match anything we've been told to\n // remember?\n const matchedIndex =
root.__rememberedObjects.indexOf(controller.object);\n\n // Why yes, it does!\n if (matchedIndex !== -1) {\n //
Let me fetch a map of controllers for thcommon.isObject.\n  let controllerMap =
root.__rememberedObjectIndecesToControllers[matchedIndex];\n\n  // Ohp, I believe this is the first controller
we've created for this\n  // object. Lets make the map fresh.\n  if (controllerMap === undefined) {\n
controllerMap = {};\n  root.__rememberedObjectIndecesToControllers[matchedIndex] =\n  controllerMap;\n
}\n\n  // Keep track of this controller\n  controllerMap[controller.property] = controller;\n\n  // Okay, now have
we saved any values for this controller?\n  if (root.load && root.load.remembered) {\n  const presetMap =
root.load.remembered;\n\n  // Which preset are we trying to load?\n  let preset;\n  if
(presetMap[gui.preset]) {\n  preset = presetMap[gui.preset];\n  } else if
(presetMap[DEFAULT_DEFAULT_PRESET_NAME]) {\n  // Uhh, you can have the default instead?\n
preset = presetMap[DEFAULT_DEFAULT_PRESET_NAME];\n  } else {\n  // Nada.\n  return;\n  }\n\n  // Did the loaded object remember thcommon.isObject? && Did we remember this particular property?\n  if
(preset[matchedIndex] && preset[matchedIndex][controller.property] !== undefined) {\n  // We did remember
something for this guy ...\n  const value = preset[matchedIndex][controller.property];\n\n  // And that's what
it is.\n  controller.initialValue = value;\n  controller.setValue(value);\n  }\n }\n\n\nfunction
add(gui, object, property, params) {\n  if (object[property] === undefined) {\n  throw new Error(`Object
\`${object}\` has no property \`${property}\``);\n  }\n\n  let controller;\n\n  if (params.color) {\n  controller = new
ColorController(object, property);\n  } else {\n  const factoryArgs = [object,

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property].concat(params.factoryArgs);\n  controller = ControllerFactory.apply(gui, factoryArgs);\n }\n\n if
(params.before instanceof Controller) {\n  params.before = params.before.__li;\n }\n\n recallSavedValue(gui,
controller);\n\n dom.addClass(controller.domElement, 'c');\n\n const name = document.createElement('span');\n
dom.addClass(name, 'property-name');\n name.innerHTML = controller.property;\n\n const container =
document.createElement('div');\n container.appendChild(name);\n
container.appendChild(controller.domElement);\n\n const li = addRow(gui, container, params.before);\n\n
dom.addClass(li, GUI.CLASS_CONTROLLER_ROW);\n if (controller instanceof ColorController) {\n
dom.addClass(li, 'color');\n } else {\n  dom.addClass(li, typeof controller.getValue());\n }\n\n
augmentController(gui, li, controller);\n\n gui.__controllers.push(controller);\n\n return controller;\n}\n\nfunction
getLocalStorageHash(gui, key) {\n // TODO how does this deal with multiple GUI's?\n return
document.location.href + ' ' + key;\n}\n\nfunction addPresetOption(gui, name, setSelected) {\n const opt =
document.createElement('option');\n opt.innerHTML = name;\n opt.value = name;\n
gui.__preset_select.appendChild(opt);\n if (setSelected) {\n  gui.__preset_select.selectedIndex =
gui.__preset_select.length - 1;\n }\n}\n\nfunction showHideExplain(gui, explain) {\n explain.style.display =
gui.useLocalStorage ? 'block' : 'none';\n}\n\nfunction addSaveMenu(gui) {\n const div = gui.__save_row =
document.createElement('li');\n\n dom.addClass(gui.domElement, 'has-save');\n\n gui.__ul.insertBefore(div,
gui.__ul.firstChild);\n\n dom.addClass(div, 'save-row');\n\n const gears = document.createElement('span');\n
gears.innerHTML = '&nbsp;';\n dom.addClass(gears, 'button gears');\n\n // TODO replace with
FunctionController\n const button = document.createElement('span');\n button.innerHTML = 'Save';\n
dom.addClass(button, 'button');\n dom.addClass(button, 'save');\n\n const button2 =
document.createElement('span');\n button2.innerHTML = 'New';\n dom.addClass(button2, 'button');\n
dom.addClass(button2, 'save-as');\n\n const button3 = document.createElement('span');\n button3.innerHTML =
'Revert';\n dom.addClass(button3, 'button');\n dom.addClass(button3, 'revert');\n\n const select =
gui.__preset_select = document.createElement('select');\n\n if (gui.load && gui.load.remembered) {\n
common.each(gui.load.remembered, function(value, key) {\n  addPresetOption(gui, key, key === gui.preset);\n
});\n } else {\n  addPresetOption(gui, DEFAULT_DEFAULT_PRESET_NAME, false);\n }\n\n dom.bind(select,
'change', function() {\n  for (let index = 0; index < gui.__preset_select.length; index++) {\n
gui.__preset_select[index].innerHTML = gui.__preset_select[index].value;\n  }\n\n gui.preset = this.value;\n
});\n\n div.appendChild(select);\n div.appendChild(gears);\n div.appendChild(button);\n
div.appendChild(button2);\n div.appendChild(button3);\n\n if (SUPPORTS_LOCAL_STORAGE) {\n const
explain = document.getElementById('dg-local-explain');\n const localStorageCheckBox =
document.getElementById('dg-local-storage');\n const saveLocally = document.getElementById('dg-save-
locally');\n\n saveLocally.style.display = 'block';\n\n if (localStorage.getItem(getLocalStorageHash(gui,
'isLocal')) === 'true') {\n  localStorageCheckBox.setAttribute('checked', 'checked');\n }\n\n
showHideExplain(gui, explain);\n\n // TODO: Use a boolean controller, fool!\n
dom.bind(localStorageCheckBox, 'change', function() {\n  gui.useLocalStorage = !gui.useLocalStorage;\n
showHideExplain(gui, explain);\n });\n }\n\n const newConstructorTextArea = document.getElementById('dg-
new-constructor');\n\n dom.bind(newConstructorTextArea, 'keydown', function(e) {\n  if (e.metaKey && (e.which
=== 67 || e.keyCode === 67)) {\n  SAVE_DIALOGUE.hide();\n }\n });\n\n dom.bind(gears, 'click', function()
{\n  newConstructorTextArea.innerHTML = JSON.stringify(gui.getSaveObject(), undefined, 2);\n
SAVE_DIALOGUE.show();\n newConstructorTextArea.focus();\n newConstructorTextArea.select();\n });\n\n
dom.bind(button, 'click', function() {\n  gui.save();\n });\n\n dom.bind(button2, 'click', function() {\n const
presetName = prompt('Enter a new preset name.);\n  if (presetName) {\n  gui.saveAs(presetName);\n  }\n
});\n\n dom.bind(button3, 'click', function() {\n  gui.revert();\n });\n\n //
div.appendChild(button2);\n}\n\nfunction addResizeHandle(gui) {\n let pmouseX;\n\n gui.__resize_handle =
document.createElement('div');\n\n common.extend(gui.__resize_handle.style, {\n\n width: '6px',\n marginLeft:
'-3px',\n height: '200px',\n cursor: 'ew-resize',\n position: 'absolute'\n // border: '1px solid blue'\n\n });\n\n
function drag(e) {\n  e.preventDefault();\n\n gui.width += pmouseX - e.clientX;\n  gui.onResize();\n  pmouseX

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= e.clientX;\n\n return false;\n }\n\n function dragStop() {\n  dom.removeClass(gui.__closeButton,
GUI.CLASS_DRAG);\n  dom.unbind(window, 'mousemove', drag);\n  dom.unbind(window, 'mouseup',
dragStop);\n }\n\n function dragStart(e) {\n  e.preventDefault();\n\n  pmouseX = e.clientX;\n\n  dom.addClass(gui.__closeButton, GUI.CLASS_DRAG);\n  dom.bind(window, 'mousemove', drag);\n  dom.bind(window, 'mouseup', dragStop);\n\n  return false;\n }\n\n  dom.bind(gui.__resize_handle, 'mousedown',
dragStart);\n  dom.bind(gui.__closeButton, 'mousedown', dragStart);\n\n  gui.domElement.insertBefore(gui.__resize_handle, gui.domElement.firstChild);\n}\n\nfunction
setWidth(gui, w) {\n  gui.domElement.style.width = w + 'px';\n  // Auto placed save-rows are position fixed, so we
have to\n  // set the width manually if we want it to bleed to the edge\n  if (gui.__save_row && gui.autoPlace) {\n
  gui.__save_row.style.width = w + 'px';\n  }\n  if (gui.__closeButton) {\n  gui.__closeButton.style.width = w +
'px';\n  }\n}\n\nfunction getCurrentPreset(gui, useInitialValues) {\n  const toReturn = {};\n\n  // For each object I'm
remembering\n  common.each(gui.__rememberedObjects, function(val, index) {\n  const savedValues = {};\n\n  // The controllers I've made for thcommon.isObject by property\n  const controllerMap =\n  gui.__rememberedObjectIndecesToControllers[index];\n\n  // Remember each value for each property\n  common.each(controllerMap, function(controller, property) {\n  savedValues[property] = useInitialValues ?
controller.initialValue : controller.getValue();\n  });\n\n  // Save the values for thcommon.isObject\n
toReturn[index] = savedValues;\n  });\n\n  return toReturn;\n}\n\nfunction setPresetSelectIndex(gui) {\n  for (let
index = 0; index < gui.__preset_select.length; index++) {\n  if (gui.__preset_select[index].value === gui.preset)
{\n  gui.__preset_select.selectedIndex = index;\n  }\n  }\n}\n\nfunction updateDisplays(controllerArray) {\n  if
(controllerArray.length !== 0) {\n  requestAnimationFrame.call(window, function() {\n
  updateDisplays(controllerArray);\n  });\n  }\n\n  common.each(controllerArray, function(c) {\n
  c.updateDisplay();\n  });\n}\n\nexport default GUI;\n", "// stats.js -
http://github.com/mrdoob/stats.js\n(function(f,e){"object"===typeof exports&&"undefined"!==typeof
module?module.exports=e):"function"===typeof define&&define.amd?define(e):f.Stats=e})(this,function(){var
f=function(){function e(a){c.appendChild(a.dom);return a}function u(a){for(var
d=0;d<c.children.length;d++)c.children[d].style.display=d===a?"block":"none";l=a}var
l=0,c=document.createElement("div");c.style.cssText="position:fixed;top:0;left:0;cursor:pointer;opacity:0.9;z-
index:10000";c.addEventListener("click",function(a){a.preventDefault();\nu(++l%c.children.length)},!1);var
k=(performance||Date).now(),g=k,a=0,r=e(new f.Panel("FPS",l,"#0ff",l,"#002")),h=e(new
f.Panel("MS",l,"#0f0",l,"#020"));if(self.performance&&self.performance.memory)var t=e(new
f.Panel("MB",l,"#f08",l,"#201"));u(0);return{REVISION:16,dom:c,addPanel:e,showPanel:u,begin:function(){k=(p
erformance||Date).now(),end:function(){a++;var c=(performance||Date).now();h.update(c-
k,200);if(c>g+1E3&&(r.update(1E3*a/(c-g),100),g=c,a=0,t))}{var
d=performance.memory;t.update(d.usedJSHeapSize/\n1048576,d.jsHeapSizeLimit/1048576)}return
c},update:function(){k=this.end(),domElement:c,setMode:u}};f.Panel=function(e,f,l){var
c=Infinity,k=0,g=Math.round,a=g(window.devicePixelRatio||1),r=80*a,h=48*a,t=3*a,v=2*a,d=3*a,m=15*a,n=74*a
,p=30*a,q=document.createElement("canvas");q.width=r;q.height=h;q.style.cssText="width:80px;height:48px";v
ar b=q.getContext("2d");b.font="bold "+9*a+"px Helvetica,Arial,sans-
serif";b.textBaseline="top";b.fillStyle=l;b.fillRect(0,0,r,h);b.fillStyle=f;b.fillText(e,t,v);nb.fillRect(d,m,n,p);b.fill
Style=l;b.globalAlpha=.9;b.fillRect(d,m,n,p);return{dom:q,update:function(h,w){c=Math.min(c,h);k=Math.max(k,h
);b.fillStyle=l;b.globalAlpha=1;b.fillRect(0,0,r,m);b.fillStyle=f;b.fillText(g(h)+" "+e+" ("+"g(c)+"-
"+"g(k)+")",t,v);b.drawImage(q,d+a,m,n-a,p,d,m,n-a,p);b.fillRect(d+n-
a,m,a,p);b.fillStyle=l;b.globalAlpha=.9;b.fillRect(d+n-a,m,a,g((1-h/w)*p))}};return f}};\n", "/*\n  * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n  * Licensed under the Apache License, Version 2.0 (the
"License");\n  * you may not use this file except in compliance with the License.\n  * You may obtain a copy of
the License at\n  * http://www.apache.org/licenses/LICENSE-2.0\n  * Unless required by applicable
law or agreed to in writing, software\n  * distributed under the License is distributed on an "AS IS" BASIS,\n  *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n  * See the License

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for the specific language governing permissions and * limitations under the License.*

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=====
*\nimport*as tf from"@tensorflow/tfjs-
core";import{util,tidy,div,sub,buffer,Tensor,browser,pad3d,scalar,concat,tensor2d,tensor}from"@tensorflow/tfjs-
core";import{loadGraphModel}from"@tensorflow/tfjs-converter";var
VALID_OUTPUT_STRIDES=[8,16,32];function assertValidOutputStride(e){util.assert("number"===typeof
e,function(){return"outputStride is not a
number"}),util.assert(VALID_OUTPUT_STRIDES.indexOf(e)>=0,function(){return"outputStride of "+e+" is
invalid. It must be either 8, 16, or 32"})}function assertValidResolution(e,t){util.assert("number"===typeof
e,function(){return"resolution is not a number"}),util.assert((e-1)%t===0,function(){return"resolution of "+e+" is
invalid for output stride "+t+"."})}function toFloatIfInt(e){return
tidy(function(){return"int32"===e.dtype&&(e=e.toFloat()),e=div(e,127.5),sub(e,1)})}var
MobileNet=function(){function e(e,t){this.model=e;var r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-
1===r[2],function(){return"Input shape ["+r[1]+", "+r[2]+"] must both be -1"}),this.outputStride=t}return
e.prototype.predict=function(e){var t=this;return tidy(function(){var
r=toFloatIfInt(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2],a=n[3];return{heatmapScores:i.squeeze(
).sigmoid(),offsets:o.squeeze(),displacementFwd:s.squeeze(),displacementBwd:a.squeeze()})},e.prototype.dispose
=function(){this.model.dispose(),e()};function half(e){return Math.floor(e/2)}var MaxHeap=function(){function
e(e,t){this.priorityQueue=new Array(e),this.numberOfElements=-1,this.getElementValue=t}return
e.prototype.enqueue=function(e){this.priorityQueue[++this.numberOfElements]=e,this.swim(this.numberOfElemen
ts)},e.prototype.dequeue=function(){var e=this.priorityQueue[0];return this.exchange(0,this.numberOfElements--
),this.sink(0),this.priorityQueue[this.numberOfElements+1]=null,e},e.prototype.empty=function(){return-
1===this.numberOfElements},e.prototype.size=function(){return
this.numberOfElements+1},e.prototype.all=function(){return
this.priorityQueue.slice(0,this.numberOfElements+1)},e.prototype.max=function(){return
this.priorityQueue[0]},e.prototype.swim=function(e){for(;e>0&&this.less(half(e),e);)this.exchange(e,half(e)),e=half
(e)},e.prototype.sink=function(e){for(;2*e<=this.numberOfElements;){var
t=2*e;if(t<this.numberOfElements&&this.less(t,t+1)&&t++,!this.less(e,t))break;this.exchange(e,t),e=t}},e.prototype
.getValueAt=function(e){return this.getElementValue(this.priorityQueue[e])},e.prototype.less=function(e,t){return
this.getValueAt(e)<this.getValueAt(t)},e.prototype.exchange=function(e,t){var
r=this.priorityQueue[e];this.priorityQueue[e]=this.priorityQueue[t],this.priorityQueue[t]=r,e()};function
scoreIsMaximumInLocalWindow(e,t,r,n,o,i){for(var s=i.shape,a=s[0],u=s[1],l=!0,f=Math.max(r-
o,0),c=Math.min(r+o+1,a),d=f;d<c;++d){for(var p=Math.max(n-
o,0),h=Math.min(n+o+1,u),m=p;m<h;++m)if(i.get(d,m,e)>t){l=!1;break}if(!l)break}return l}function
buildPartWithScoreQueue(e,t,r){for(var n=r.shape,o=n[0],i=n[1],s=n[2],a=new MaxHeap(o*i*s,function(e){return
e.score}),u=0;u<o;++u)for(var l=0;l<i;++l)for(var f=0;f<s;++f){var
c=r.get(u,l,f);c<e||scoreIsMaximumInLocalWindow(f,c,u,l,t,r)&&a.enqueue({score:c,part:{heatmapY:u,heatmapX:l,
id:f}})}return a}var
partNames=["nose","leftEye","rightEye","leftEar","rightEar","leftShoulder","rightShoulder","leftElbow",
"rightElbow","leftWrist","rightWrist","leftHip","rightHip","leftKnee","rightKnee","leftAnkle","rightAn
kle"],NUM_KEYPOINTS=partNames.length,partIds=partNames.reduce(function(e,t,r){return
e[t]=r,e},{}),connectedPartNames=[["leftHip","leftShoulder"],["leftElbow","leftShoulder"],["leftElbow","lef
tWrist"],["leftHip","leftKnee"],["leftKnee","leftAnkle"],["rightHip","rightShoulder"],["rightElbow","right
Shoulder"],["rightElbow","rightWrist"],["rightHip","rightKnee"],["rightKnee","rightAnkle"],["leftShould
er","rightShoulder"],["leftHip","rightHip"]],poseChain=[["nose","leftEye"],["leftEye","leftEar"],["nose",
"rightEye"],["rightEye","rightEar"],["nose","leftShoulder"],["leftShoulder","leftElbow"],["leftElbow","lef
tWrist"],["leftShoulder","leftHip"],["leftHip","leftKnee"],["leftKnee","leftAnkle"],["nose","rightShould
er"],["rightShoulder","rightElbow"],["rightElbow","rightWrist"],["rightShoulder","rightHip"],["rightHip",
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\'rightKnee\'],[\'rightKnee\',\'rightAnkle\']],connectedPartIndices=connectedPartNames.map(function(e){ var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),partChannels=[\'left_face\',\'right_face\',\'right_upper_leg_front\',\'rig
ht_lower_leg_back\',\'right_upper_leg_back\',\'left_lower_leg_front\',\'left_upper_leg_front\',\'left_upper_leg_ba
ck\',\'left_lower_leg_back\',\'right_feet\',\'right_lower_leg_front\',\'left_feet\',\'torso_front\',\'torso_back\',\'rig
ht_upper_arm_front\',\'right_upper_arm_back\',\'right_lower_arm_back\',\'left_lower_arm_front\',\'left_upper_ar
m_front\',\'left_upper_arm_back\',\'left_lower_arm_back\',\'right_hand\',\'right_lower_arm_front\',\'left_hand\']
;function getOffsetPoint(e,t,r,n){return{y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS)}}function
getImageCoords(e,t,r){ var
n=getOffsetPoint(e.heatmapY,e.heatmapX,e.id,r),o=n.y,i=n.x;return{x:e.heatmapX*t+i,y:e.heatmapY*t+o}}functio
n clamp(e,t,r){return e<t?t:e>r?r:e}function squaredDistance(e,t,r,n){ var o=r-e,i=n-t;return o*o+i*i}function
addVectors(e,t){return{x:e.x+t.x,y:e.y+t.y}}var parentChildrenTuples=poseChain.map(function(e){ var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),parentToChildEdges=parentChildrenTuples.map(function(e){return
e[1]}),childToParentEdges=parentChildrenTuples.map(function(e){return e[0]});function
getDisplacement(e,t,r){ var n=r.shape[2]/2;return{y:r.get(t.y,t.x,e),x:r.get(t.y,t.x,n+e)}}function
getStridedIndexNearPoint(e,t,r,n){return{y:clamp(Math.round(e.y/t),0,r-1),x:clamp(Math.round(e.x/t),0,n-
1)}}function traverseToTargetKeypoint(e,t,r,n,o,i,s,a){ void 0===a&&(a=2);for(var
u=n.shape,l=u[0],f=u[1],c=getDisplacement(e,getStridedIndexNearPoint(t.position,i,l,f),s),d=addVectors(t.position,c
),p=0;p<a;p++){ var
h=getStridedIndexNearPoint(d,i,l,f),m=getOffsetPoint(h.y,h.x,r,o);d=addVectors({x:h.x*i,y:h.y*i},{x:m.x,y:m.y})}
var g=getStridedIndexNearPoint(d,i,l,f),_n.get(g.y,g.x,r);return{ position:d,part:partNames[r],score:_ }}function
decodePose(e,t,r,n,o,i){ var s=t.shape[2],a=parentToChildEdges.length,u=new
Array(s),l=e.part,f=e.score,c=getImageCoords(l,n,r);u[l.id]={ score:f,part:partNames[l.id],position:c };for(var d=a-
1;d>=0;--d){ var
p=parentToChildEdges[d],h=childToParentEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTargetKeypoint(d,u[p],h,t,r,n
,i))}for(d=0;d<a;++d){ p=childToParentEdges[d],h=parentToChildEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTarge
tKeypoint(d,u[p],h,t,r,n,o))}return u}function withinNmsRadiusOfCorrespondingPoint(e,t,r,n){ var o=r.x,i=r.y;return
e.some(function(e){ var r=e.keypoints[n].position;return squaredDistance(i,o,r.y,r.x)<=t})}function
getInstanceScore(e,t,r){return r.reduce(function(r,n,o){ var i=n.position,s=n.score;return
withinNmsRadiusOfCorrespondingPoint(e,t,i,o)||((r+=s),r),0)/r.length}var kLocalMaximumRadius=1;function
decodeMultiplePoses(e,t,r,n,o,i,s,a){ void 0===s&&(s=.5),void 0===a&&(a=20);for(var
u=[],l=buildPartWithScoreQueue(s,kLocalMaximumRadius,e),f=a*a;u.length<i&&!l.empty();){ var
c=l.dequeue();if(!withinNmsRadiusOfCorrespondingPoint(u,f,getImageCoords(c.part,o,t),c.part.id)){ var
d=decodePose(c,e,t,o,r,n),p=getInstanceScore(u,f,d);u.push({ keypoints:d,score:p })}return u}var
__assign=function(){return(__assign=Object.assign||function(e){for(var t,r=1,n=arguments.length;r<n;r++)for(var o
in t=arguments[r])Object.prototype.hasOwnProperty.call(t,o)&&(e[o]=t[o]);return
e}).apply(this,arguments)};function __awaiter(e,t,r,n){return new(r||(r=Promise))(function(o,i){function
s(e){try{u(n.next(e))}catch(e){i(e)}}function a(e){try{u(n.throw(e))}catch(e){i(e)}}function
u(e){e.done?o(e.value):new r(function(t){t(e.value)}).then(s,a)}u((n=n.apply(e,t||[])).next())}}function
__generator(e,t){ var r,n,o,i,s={label:0,sent:function(){if(1&o[0])throw o[1];return o[1]},trys:[],ops:[]};return
i={next:a(0),throw:a(1),return:a(2)},\'function\'==typeof Symbol&&(i[Symbol.iterator]=function(){return
this}),i;function a(i){return function(a){return function(i){if(r)throw new TypeError(\'Generator is already
executing.\');for(;s;try{if(r=1,n&&(o=2&i[0]?n.return:i[0]?n.throw||((o=n.return)&&o.call(n),0):n.next)&&!o=o.c
all(n,i[1])).done)return o;switch(n=0,o&&(i=[2&i[0],o.value]),i[0]){case 0:case 1:o=i;break;case 4:return
s.label++,{ value:i[1],done:!1};case 5:s.label++,n=i[1],i=[0];continue;case
7:i=s.ops.pop(),s.trys.pop();continue;default:if(!(o=(o=s.trys).length>0&&o[o.length-
1])&&(6===i[0]||2===i[0])){s=0;continue}if(3===i[0]&&(!o||i[1]>o[0]&&i[1]<o[3])){s.label=i[1];break}if(6===i[
0]&&s.label<o[1]){s.label=o[1],o=i;break}if(o&&s.label<o[2]){s.label=o[2],s.ops.push(i);break}o[2]&&s.ops.pop(
),s.trys.pop();continue}i=t.call(e,s)}catch(e){i=[6,e],n=0}finally{r=o=0}if(5&i[0])throw

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i[1];return { value:i[0]?i[1]:void 0,done:!0 } }([i,a] ) } }function eitherPointDoesntMeetConfidence(e,t,r){ return
e<r||t<r }function getAdjacentKeyPoints(e,t){return connectedPartIndices.reduce(function(r,n){ var
o=n[0],i=n[1];return eitherPointDoesntMeetConfidence(e[o].score,e[i].score,t)?r:(r.push([e[o],e[i]]),r),[]) } }var
NEGATIVE_INFINITY=Number.NEGATIVE_INFINITY,POSITIVE_INFINITY=Number.POSITIVE_INFINITY
;function getBoundingBox(e){ return e.reduce(function(e,t){ var
r=e.maxX,n=e.maxY,o=e.minX,i=e.minY,s=t.position,a=s.x,u=s.y;return { maxX:Math.max(r,a),maxY:Math.max(n,
u),minX:Math.min(o,a),minY:Math.min(i,u) } }, { maxX:NEGATIVE_INFINITY,maxY:NEGATIVE_INFINITY,min
X:POSITIVE_INFINITY,minY:POSITIVE_INFINITY } ) }function getBoundingBoxPoints(e){ var
t=getBoundingBox(e),r=t.minX,n=t.minY,o=t.maxX,i=t.maxY;return [{ x:r,y:n }, { x:o,y:n }, { x:o,y:i }, { x:r,y:i } ] }functi
on toTensorBuffer(e,t){ return void 0===t&&(t="float32"),__awaiter(this,void 0,void 0,function() { var r;return
__generator(this,function(n) { switch(n.label) { case 0:return [4,e.data()]; case 1:return
r=n.sent(),[2,buffer(e.shape,t,r)] } } ) } }function toTensorBuffers3D(e){ return __awaiter(this,void 0,void
0,function() { return __generator(this,function(t) { return [2,Promise.all(e.map(function(e) { return
toTensorBuffer(e,"float32") } ) ) ] } ) } }function scalePose(e,t,r,n,o) { return void 0===n&&(n=0),void
0===o&&(o=0), { score:e.score,keypoints:e.keypoints.map(function(e) { var
i=e.score,s=e.part,a=e.position;return { score:i,part:s,position: { x:a.x*r+o,y:a.y*t+n } } } ) } }function
scalePoses(e,t,r,n,o) { return void 0===n&&(n=0),void
0===o&&(o=0),1===r&&1===t&&0===n&&0===o?e.map(function(e) { return scalePose(e,t,r,n,o) } ) }function
flipPoseHorizontal(e,t) { return { score:e.score,keypoints:e.keypoints.map(function(e) { var
r=e.score,n=e.part,o=e.position;return { score:r,part:n,position: { x:t-1-o.x,y:o.y } } } ) } }function
flipPosesHorizontal(e,t) { return t<=0?e.map(function(e) { return flipPoseHorizontal(e,t) } ) }function
getInputTensorDimensions(e) { return e instanceof Tensor?[e.shape[0],e.shape[1]]:[e.height,e.width] }function
toInputTensor(e) { return e instanceof Tensor?e.browser.fromPixels(e) }function padAndResizeTo(e,t) { var
r=t[0],n=t[1],o=getInputTensorDimensions(e),i=o[0],s=o[1],a=n/r,u=[0,0,0,0],l=u[0],f=u[1],c=u[2],d=u[3];return
s/i<a?(l=0,f=0,c=Math.round(.5*(a*i-s)),d=Math.round(.5*(a*i-s)):(l=Math.round(.5*(1/a*s-
i)),f=Math.round(.5*(1/a*s-i)),c=0,d=0), { resized:tidy(function() { var
t=toInputTensor(e);return(t=pad3d(t,[[l,f],[c,d],[0,0]])).resizeBilinear([r,n]),padding: { top:l,left:c,right:d,bottom:f
} } ) }function scaleAndFlipPoses(e,t,r,n,o) { var
i=t[0],s=t[1],a=r[0],u=r[1],l=scalePoses(e,(i+n.top+n.bottom)/a,(s+n.left+n.right)/u,-n.top,-n.left);return
o?flipPosesHorizontal(l,s):l }function mod(e,t) { return tidy(function() { var r=e.div(scalar(t,"int32"));return
e.sub(r.mul(scalar(t,"int32"))) } ) }function argmax2d(e) { var t=e.shape,r=t[0],n=t[1],o=t[2];return
tidy(function() { var
t=e.reshape([r*n,o]).argMax(0),i=t.div(scalar(n,"int32")).expandDims(1),s=mod(t,n).expandDims(1);return
concat([i,s],1) } ) }function getPointsConfidence(e,t) { for(var r=t.shape[0],n=new Float32Array(r),o=0;o<r;o++) { var
i=t.get(o,0),s=t.get(o,1);n[o]=e.get(i,s,o) } return n }function
getOffsetPoint$1(e,t,r,n) { return { y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS) } }function
getOffsetVectors(e,t) { for(var r=[],n=0;n<NUM_KEYPOINTS;n++) { var
o=getOffsetPoint$1(e.get(n,0).valueOf(),e.get(n,1).valueOf(),n,t),i=o.x,s=o.y;r.push(s),r.push(i) } return
tensor2d(r,[NUM_KEYPOINTS,2]) }function getOffsetPoints(e,t,r) { return tidy(function() { var
n=getOffsetVectors(e,r);return e.toTensor().mul(scalar(t,"int32")).toFloat().add(n) } ) }function
decodeSinglePose(e,t,r) { return __awaiter(this,void 0,void 0,function() { var n,o,i,s,a,u,l,f,c,d;return
__generator(this,function(p) { switch(p.label) { case 0:return
n=0,o=argmax2d(e),[4,Promise.all([toTensorBuffer(e),toTensorBuffer(t),toTensorBuffer(o,"int32")]); case
1:return i=p.sent(),s=i[0],a=i[1],u=i[2],[4,toTensorBuffer(l=getOffsetPoints(u,r,a))]; case 2:return
f=p.sent(),c=Array.from(getPointsConfidence(s,u)),d=c.map(function(e,t) { return
n+=e, { position: { y:f.get(t,0),x:f.get(t,1) }, part:partNames[t],score:e } },o.dispose(),l.dispose(),[2, { keypoints:d,score:n
/d.length } ] } ) } } } }var MOBILENET_BASE_URL="https://storage.googleapis.com/tfjs-
models/savedmodel/posenet/mobilenet/",RESNET50_BASE_URL="https://storage.googleapis.com/tfjs-

```



```

models/savedmodel/posenet/resnet50/";function resNet50Checkpoint(e,t){var r="model-stride"+e+".json";return
4==t?RESNET50_BASE_URL+"float"+r:RESNET50_BASE_URL+"quant"+t+"^"+r}function
mobileNetCheckpoint(e,t,r){var n={1:"100",.75:"075",.5:"050"},o="model-stride"+e+".json";return
4==r?MOBILENET_BASE_URL+"float"+n[t]+"^"+o:MOBILENET_BASE_URL+"quant"+r+"^"+n[t]+"^"+
o}function toFloatIfInt$(e){return tidy(function(){return e.dtype==="int32"===e.dtype&&(e=e.toFloat());var t=tensor([-123.15,-
115.9,-103.06]);return e.add(t)})}var ResNet=function(){function e(e,t){this.model=e;var
r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-1===r[2],function(){return"Input shape ["+r[1]+",
"+r[2]+"] must both be equal to or -1"}),this.outputStride=t}return e.prototype.predict=function(e){var
t=this;return tidy(function(){var
r=toFloatIfInt$(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2];return {heatmapScores:n[3].squeeze().
sigmoid(),offsets:s.squeeze(),displacementFwd:o.squeeze(),displacementBwd:i.squeeze()}}),e.prototype.dispose=f
unction(){this.model.dispose(),e(),MOBILENET_V1_CONFIG={architecture:"MobileNetV1",outputStride:16,
multiplier:.75,inputResolution:257},VALID_ARCHITECTURE=["MobileNetV1","ResNet50"],VALID_STRID
E={MobileNetV1:[8,16,32],ResNet50:[32,16]},VALID_INPUT_RESOLUTION=[161,193,257,289,321,353,385,41
7,449,481,513,801],VALID_MULTIPLIER={MobileNetV1:[.5,.75,1],ResNet50:[1]},VALID_QUANT_BYTES=[1
,2,4];function
validateModelConfig(e){if(null==(e=e||MOBILENET_V1_CONFIG).architecture&&(e.architecture="MobileNetV
1"),VALID_ARCHITECTURE.indexOf(e.architecture)<0)throw new Error("Invalid architecture
"+e.architecture+". Should be one of
"+VALID_ARCHITECTURE);if(null==e.inputResolution&&(e.inputResolution=257),VALID_INPUT_RESOLU
TION.indexOf(e.inputResolution)<0)throw new Error("Invalid inputResolution "+e.inputResolution+". Should be
one of
"+VALID_INPUT_RESOLUTION);if(null==e.outputStride&&(e.outputStride=16),VALID_STRIDE[e.architectur
e].indexOf(e.outputStride)<0)throw new Error("Invalid outputStride "+e.outputStride+". Should be one of
"+VALID_STRIDE[e.architecture]+"] for architectre
"+e.architecture+".");if(null==e.multiplier&&(e.multiplier=1),VALID_MULTIPLIER[e.architecture].indexOf(e.
multiplier)<0)throw new Error("Invalid multiplier "+e.multiplier+". Should be one of
"+VALID_MULTIPLIER[e.architecture]+"] for architectre
"+e.architecture+".");if(null==e.quantBytes&&(e.quantBytes=4),VALID_QUANT_BYTES.indexOf(e.quantByte
s)<0)throw new Error("Invalid quantBytes "+e.quantBytes+". Should be one of "+VALID_QUANT_BYTES+"
for architectre "+e.architecture+".");return e}var
SINGLE_PERSON_INFERENCE_CONFIG={flipHorizontal:!1},MULTI_PERSON_INFERENCE_CONFIG={fli
pHorizontal:!1,maxDetections:5,scoreThreshold:.5,nmsRadius:20};function validateMultiPersonInputConfig(e){var
t=e.maxDetections,r=e.scoreThreshold,n=e.nmsRadius;if(t<=0)throw new Error("Invalid maxDetections "+t+"".
Should be > 0");if(r<0||r>1)throw new Error("Invalid scoreThreshold "+r+"". Should be in range [0.0,
1.0]);if(n<=0)throw new Error("Invalid nmsRadius "+n+"").}var PoseNet=function(){function
e(e,t){this.baseModel=e,this.inputResolution=t}return e.prototype.estimateMultiplePoses=function(e,t){return void
0===t&&(t=MULTI_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){var
r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_I,E,v,N,y;return __generator(this,function(T){switch(T.label){case 0:return
r=__assign({},MULTI_PERSON_INFERENCE_CONFIG,t),validateMultiPersonInputConfig(t),n=this.baseModel.
outputStride,o=this.inputResolution,assertValidOutputStride(n),assertValidResolution(this.inputResolution,n),i=getI
nputTensorDimensions(e),s=i[0],a=i[1],u=padAndResizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predi
ct(l),d=c.heatmapScores,p=c.offsets,h=c.displacementFwd,m=c.displacementBwd,[4,toTensorBuffers3D([d,p,h,m])]
);case 1:return
g=T.sent(),_=g[0],I=g[1],E=g[2],v=g[3],[4,decodeMultiplePoses(_I,E,v,n,r.maxDetections,r.scoreThreshold,r.nmsR
adius)];case 2:return
N=T.sent(),y=scaleAndFlipPoses(N,[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.di
spose(),[2,y]}})}),e.prototype.estimateSinglePose=function(e,t){return void

```

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0===t&&(t=SINGLE_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){var
r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_;return __generator(this,function(I){switch(I.label){case 0:return
r=__assign({},SINGLE_PERSON_INFERENCE_CONFIG,t),n=this.baseModel.outputStride,o=this.inputResolutio
n,assertValidOutputStride(n),assertValidResolution(o,n),i=getInputTensorDimensions(e),s=i[0],a=i[1],u=padAndRe
sizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predict(l),d=c.heatmapScores,p=c.offsets,h=c.displacemen
tFwd,m=c.displacementBwd,[4,decodeSinglePose(d,p,n)];case 1:return
g=I.sent(),_=scaleAndFlipPoses([g],[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.di
spose(),[2,_[0]]}})},e.prototype.estimatePoses=function(e,t){return __awaiter(this,void 0,void 0,function(){return
__generator(this,function(r){switch(r.label){case 0:return"single-
person"!=t.decodingMethod?[3,2]:[4,this.estimateSinglePose(e,t)];case 1:return[2,[r.sent()]];case
2:return[2,this.estimateMultiplePoses(e,t)]}})},e.prototype.dispose=function(){this.baseModel.dispose(),e()};fun
ction loadMobileNet(e){return __awaiter(this,void 0,void 0,function(){var t,r,n,o,i,s;return
__generator(this,function(a){switch(a.label){case
0;if(t=e.outputStride,r=e.quantBytes,n=e.multiplier,null==tf)throw new Error("Cannot find TensorFlow.js. If you
are using a <script> tag, please also include @tensorflow/tfjs on the page before using this\n    model.");return
o=mobileNetCheckpoint(t,n,r),[4,loadGraphModel(e.modelUrl||o)];case 1:return i=a.sent(),s=new
MobileNet(i,t),[2,new PoseNet(s,e.inputResolution)]}})}function loadResNet(e){return __awaiter(this,void 0,void
0,function(){var t,r,n,o,i;return __generator(this,function(s){switch(s.label){case
0;if(t=e.outputStride,r=e.quantBytes,null==tf)throw new Error("Cannot find TensorFlow.js. If you are using a
<script> tag, please also include @tensorflow/tfjs on the page before using this\n    model.");return
n=resNet50Checkpoint(t,r),[4,loadGraphModel(e.modelUrl||n)];case 1:return o=s.sent(),i=new ResNet(o,t),[2,new
PoseNet(i,e.inputResolution)]}})}function load(e){return void
0===e&&(e=MOBILENET_V1_CONFIG),__awaiter(this,void 0,void 0,function(){return
__generator(this,function(t){return"ResNet50"===e.validateModelConfig(e).architecture?[2,loadResNet(e)]:"M
obileNetV1"===e.architecture?[2,loadMobileNet(e)]:[2,null]}})}export{decodeMultiplePoses,decodeSinglePose,
MobileNet,partChannels,partIds,partNames,poseChain,load,PoseNet,VALID_INPUT_RESOLUTION,getAdjacent
KeyPoints,getBoundingBox,getBoundingBoxPoints,scalePose};\n","/*\n * @license\n * Copyright 2019 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *
https://www.apache.org/licenses/LICENSE-2.0\n * \n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an "AS IS" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=====
\n
*\nimport * as posenet from '@tensorflow-models/posenet';\nimport * as tf from '@tensorflow/tfjs-core';\n\nconst
COLOR = 'aqua';\nconst BOUNDING_BOX_COLOR = 'red';\nconst LINE_WIDTH = 2;\n\nexport const
TRY_RESNET_BUTTON_NAME = 'tryResNetButton';\nexport const TRY_RESNET_BUTTON_TEXT = '[New]
Try ResNet50';\nconst TRY_RESNET_BUTTON_TEXT_CSS = 'width:100%;text-decoration:underline';\nconst
TRY_RESNET_BUTTON_BACKGROUND_CSS = 'background:#e61d5f';\n\nfunction isAndroid() {\n return
/Android/i.test(navigator.userAgent);\n}\n\nfunction isiOS() {\n return
/iPhone/iPad/iPod/i.test(navigator.userAgent);\n}\n\nexport function isMobile() {\n return isAndroid() ||
isiOS();\n}\n\nfunction setDatGuiPropertyCss(propertyText, liCssString, spanCssString = "") {\n var spans =
document.getElementsByClassName('property-name');\n for (var i = 0; i < spans.length; i++) {\n var text =
spans[i].textContent || spans[i].innerText;\n if (text === propertyText) {\n spans[i].parentNode.parentNode.style
= liCssString;\n if (spanCssString !== "") {\n spans[i].style = spanCssString;\n } \n } \n } \n } \n\nexport
function updateTryResNetButtonDatGuiCss() {\n setDatGuiPropertyCss(\n TRY_RESNET_BUTTON_TEXT,
TRY_RESNET_BUTTON_BACKGROUND_CSS,\n TRY_RESNET_BUTTON_TEXT_CSS);\n}\n}\n/*\n *
Toggles between the loading UI and the main canvas UI.\n *\nexport function toggleLoadingUI(\n

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showLoadingUI, loadingDivId = 'loading', mainDivId = 'main') {\n if (showLoadingUI) {\n document.getElementById(loadingDivId).style.display = 'block';\n document.getElementById(mainDivId).style.display = 'none';\n } else {\n document.getElementById(loadingDivId).style.display = 'none';\n document.getElementById(mainDivId).style.display = 'block';\n }\n\nexport function drawPoint(ctx, y, x, r, color) {\n ctx.beginPath();\n ctx.arc(x, y, r, 0, 2 * Math.PI);\n ctx.fillStyle = color;\n ctx.fill();\n}\n\n/**\n Draws a line on a canvas, i.e. a joint\n */\nexport function drawSegment([ay, ax], [by, bx], color, scale, ctx) {\n ctx.beginPath();\n ctx.moveTo(ax * scale, ay * scale);\n ctx.lineTo(bx * scale, by * scale);\n ctx.lineWidth = LINE_WIDTH;\n ctx.strokeStyle = color;\n ctx.stroke();\n}\n\n/**\n * Draws a pose skeleton by looking up all adjacent keypoints/joints\n */\nexport function drawSkeleton(keypoints, minConfidence, ctx, scale = 1) {\n const adjacentKeyPoints =\n   posenet.getAdjacentKeyPoints(keypoints, minConfidence);\n\n function toTuple({y, x}) {\n return [y, x];\n }\n\n adjacentKeyPoints.forEach((keypoints) => {\n drawSegment(\n toTuple(keypoints[0].position), toTuple(keypoints[1].position), COLOR,\n scale, ctx);\n });\n}\n\n/**\n Draw pose keypoints onto a canvas\n */\nexport function drawKeypoints(keypoints, minConfidence, ctx, scale = 1) {\n for (let i = 0; i < keypoints.length; i++) {\n const keypoint = keypoints[i];\n\n if (keypoint.score < minConfidence) {\n continue;\n }\n\n const {y, x} = keypoint.position;\n drawPoint(ctx, y * scale, x * scale, 3, COLOR);\n }\n}\n\n/**\n * Draw the bounding box of a pose. For example, for a whole person standing\n * in an image, the bounding box will begin at the nose and extend to one of\n * ankles\n */\nexport function drawBoundingBox(keypoints, ctx) {\n const boundingBox = posenet.getBoundingBox(keypoints);\n\n ctx.rect(\n boundingBox.minX, boundingBox.minY, boundingBox.maxX - boundingBox.minX,\n boundingBox.maxY - boundingBox.minY);\n\n ctx.strokeStyle = boundingBoxColor;\n ctx.stroke();\n}\n\n/**\n * Converts an array of pixel data into an ImageData object\n */\nexport async function renderToCanvas(a, ctx) {\n const [height, width] = a.shape;\n const imageData = new ImageData(width, height);\n\n const data = await a.data();\n\n for (let i = 0; i < height * width; ++i) {\n const j = i * 4;\n const k = i * 3;\n\n imageData.data[j + 0] = data[k + 0];\n imageData.data[j + 1] = data[k + 1];\n imageData.data[j + 2] = data[k + 2];\n imageData.data[j + 3] = 255;\n }\n\n ctx.putImageData(imageData, 0, 0);\n}\n\n/**\n * Draw an image on a canvas\n */\nexport function renderImageToCanvas(image, size, canvas) {\n canvas.width = size[0];\n canvas.height = size[1];\n const ctx = canvas.getContext('2d');\n\n ctx.drawImage(image, 0, 0);\n}\n\n/**\n * Draw heatmap values, one of the model outputs, on to the canvas\n * Read our blog post for a description of PoseNet's heatmap outputs\n * https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n */\nexport function drawHeatMapValues(heatMapValues, outputStride, canvas) {\n const ctx = canvas.getContext('2d');\n const radius = 5;\n const scaledValues = heatMapValues.mul(tf.scalar(outputStride, 'int32'));\n\n drawPoints(ctx, scaledValues, radius, COLOR);\n}\n\n/**\n * Used by the drawHeatMapValues method to draw heatmap points on to\n * the canvas\n */\nfunction drawPoints(ctx, points, radius, color) {\n const data = points.buffer().values;\n\n for (let i = 0; i < data.length; i += 2) {\n const pointY = data[i];\n const pointX = data[i + 1];\n\n if (pointX !== 0 && pointY !== 0) {\n ctx.beginPath();\n ctx.arc(pointX, pointY, radius, 0, 2 * Math.PI);\n ctx.fillStyle = color;\n ctx.fill();\n }\n }\n}\n\n/**\n * Draw offset vector values, one of the model outputs, on to the canvas\n * Read our blog post for a description of PoseNet's offset vector outputs\n * https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n */\nexport function drawOffsetVectors(\n heatMapValues, offsets, outputStride, scale = 1, ctx) {\n const offsetPoints =\n   posenet.singlePose.getOffsetPoints(heatMapValues, outputStride, offsets);\n\n const heatmapData = heatMapValues.buffer().values;\n const offsetPointsData = offsetPoints.buffer().values;\n\n for (let i = 0; i < heatmapData.length; i += 2) {\n const heatmapY = heatmapData[i] * outputStride;\n const heatmapX = heatmapData[i + 1] * outputStride;\n const offsetPointY = offsetPointsData[i];\n const offsetPointX = offsetPointsData[i + 1];\n\n drawSegment(\n [heatmapY, heatmapX], [offsetPointY, offsetPointX], COLOR, scale, ctx);\n }\n}\n\n/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the "License");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n * https://www.apache.org/licenses/LICENSE-2.0\n */
```

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=====
color schemes generated using d3-scale-chromatic: https://github.com/d3/d3-scale-chromatic
export const rainbow = [
  [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],
  [238, 67, 149], [255, 78, 125], [255, 94, 99], [255, 115, 75],
  [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],
  [175, 240, 91], [135, 245, 87], [96, 247, 96], [64, 243, 115],
  [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],
  [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]
];
export const warm = [
  [110, 64, 170], [106, 72, 183], [100, 81, 196], [92, 91, 206],
  [84, 101, 214], [75, 113, 221], [66, 125, 224], [56, 138, 226],
  [48, 150, 224], [40, 163, 220], [33, 176, 214], [29, 188, 205],
  [26, 199, 194], [26, 210, 182], [28, 219, 169], [33, 227, 155],
  [41, 234, 141], [51, 240, 128], [64, 243, 116], [79, 246, 105],
  [96, 247, 97], [115, 246, 91], [134, 245, 88], [155, 243, 88]
];
export const spectral = [
  [158, 1, 66], [181, 26, 71], [202, 50, 74], [219, 73, 74],
  [232, 94, 73], [242, 117, 75], [248, 142, 83], [251, 167, 96],
  [253, 190, 112], [254, 210, 129], [254, 227, 149], [254, 240, 166],
  [251, 248, 176], [243, 249, 172], [231, 245, 163], [213, 238, 159],
  [190, 229, 160], [164, 218, 163], [137, 207, 165], [110, 192, 168],
  [86, 173, 174], [70, 150, 179], [67, 127, 180], [77, 103, 173]
];
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import '@tensorflow/tfjs-backend-webgl';
import * as bodyPix from '@tensorflow-models/body-pix';
import dat from 'dat.gui';
import Stats from 'stats.js';
import {drawKeypoints, drawSkeleton, toggleLoadingUI, TRY_RESNET_BUTTON_NAME, TRY_RESNET_BUTTON_TEXT, updateTryResNetButtonDatGuiCss} from './demo_util';
import * as partColorScales from './part_color_scales';

const stats = new Stats();
const state = {
  video: null,
  stream: null,
  net: null,
  videoConstraints: {}, // Triggers the TensorFlow model to reload
  changingArchitecture: false,
  changingMultiplier: false,
  changingStride: false,
  changingResolution: false,
  changingQuantBytes: false,
};

function isAndroid() {
  return /Android/i.test(navigator.userAgent);
}

function isiOS() {
  return /iPhone|iPod/i.test(navigator.userAgent);
}

function isMobile() {
  return isAndroid() || isiOS();
}

async function getVideoInputs() {
  if (!navigator.mediaDevices || !navigator.mediaDevices.enumerateDevices) {
    console.log('enumerateDevices() not supported.');
```

```

* Loads a the camera to be used in the demo\n *\n *\n\nasync function setupCamera(cameraLabel) {\n  if
(!navigator.mediaDevices || !navigator.mediaDevices.getUserMedia) {\n    throw new Error(\n      'Browser API
navigator.mediaDevices.getUserMedia not available');\n  }\n\n  const videoElement =
document.getElementById('video');\n\n  stopExistingVideoCapture();\n\n  const videoConstraints = await
getConstraints(cameraLabel);\n\n  const stream = await navigator.mediaDevices.getUserMedia(\n    { 'audio': false,
'video': videoConstraints });\n\n  videoElement.srcObject = stream;\n\n  return new Promise((resolve) => {\n
videoElement.onloadedmetadata = () => {\n    videoElement.width = videoElement.videoWidth;\n
videoElement.height = videoElement.videoHeight;\n    resolve(videoElement);\n  });\n}\n\n\nasync function
loadVideo(cameraLabel) {\n  try {\n    state.video = await setupCamera(cameraLabel);\n  } catch (e) {\n    let info =
document.getElementById('info');\n    info.textContent = 'this browser does not support video capture,' +\n      'or
this device does not have a camera';\n    info.style.display = 'block';\n    throw e;\n  }\n\n  state.video.play();\n}\n\n\nconst defaultQuantBytes = 2;\nconst defaultMobileNetMultiplier = isMobile() ? 0.50 :
0.75;\nconst defaultMobileNetStride = 16;\nconst defaultMobileNetInternalResolution = 'medium';\nconst
defaultResNetMultiplier = 1.0;\nconst defaultResNetStride = 16;\nconst defaultResNetInternalResolution =
'low';\nconst guiState = {\n  algorithm: 'multi-person-instance',\n  estimate: 'partmap',\n  camera: null,\n  flipHorizontal: true,\n  input: {\n    architecture: 'MobileNetV1',\n    outputStride: 16,\n    internalResolution: 'low',\n    multiplier: 0.50,\n    quantBytes: 2\n  },\n  multiPersonDecoding: {\n    maxDetections: 5,\n    scoreThreshold:
0.3,\n    nmsRadius: 20,\n    numKeypointForMatching: 17,\n    refineSteps: 10\n  },\n  segmentation: {\n    segmentationThreshold: 0.7,\n    effect: 'mask',\n    maskBackground: true,\n    opacity: 0.7,\n    backgroundBlurAmount: 3,\n    maskBlurAmount: 0,\n    edgeBlurAmount: 3\n  },\n  partMap: {\n    colorScale:
'rainbow',\n    effect: 'partMap',\n    segmentationThreshold: 0.5,\n    opacity: 0.9,\n    blurBodyPartAmount: 3,\n    bodyPartEdgeBlurAmount: 3\n  },\n  showFps: !isMobile()\n};\n\nfunction toCameraOptions(cameras) {\n  const
result = { default: null }; \n\n  cameras.forEach(camera => {\n    result[camera.label] = camera.label;\n  })\n\n  return
result;\n}\n\n\n*\n * Sets up dat.gui controller on the top-right of the window\n *\n\nfunction setupGui(cameras) {\n
const gui = new dat.GUI({ width: 300 });\n\n  let architectureController = null;\n\n  guiState[TRY_RESNET_BUTTON_NAME] = function() {\n    architectureController.setValue('ResNet50')\n  };\n\n  gui.add(guiState, TRY_RESNET_BUTTON_NAME).name(TRY_RESNET_BUTTON_TEXT);\n\n  updateTryResNetButtonDatGuiCss();\n\n  gui.add(guiState, 'camera', toCameraOptions(cameras))\n    .onChange(async function(cameraLabel) {\n      state.changingCamera = true;\n\n      await
loadVideo(cameraLabel);\n\n      state.changingCamera = false;\n    });\n\n  gui.add(guiState, 'flipHorizontal');\n\n  // There are two algorithms 'person' and 'multi-person-instance'.\n  // The 'person' algorithm returns one single
segmentation mask (or body\n  // part map) for all people in the image. The 'multi-person-instance'\n  // algorithm
returns an array of segmentation mask (or body part map).\n  // Each element in the array corresponding to one of
the people. In other\n  // words, 'multi-person-instance' algorithm does instance-level person\n  // segmentation and
body part segmentation for every person in the image.\n  const algorithmController =\n    gui.add(guiState,
'algorithm', ['person', 'multi-person-instance']);\n\n  // Architecture: there are a few BodyPix models varying in size
and\n  // accuracy.\n  // The input parameters have the most effect on accuracy and speed of the\n  // network\n  let
input = gui.addFolder('Input');\n\n  // Updates outputStride\n  // Output stride: Internally, this parameter affects the
height and width\n  // of the layers in the neural network. The lower the value of the output\n  // stride the higher the
accuracy but slower the speed, the higher the\n  // value the faster the speed but lower the accuracy.\n  let
outputStrideController = null;\n  function updateGuiOutputStride(outputStride, outputStrideArray) {\n    if
(outputStrideController) {\n      outputStrideController.remove();\n    }\n    guiState.input.outputStride =
outputStride;\n    outputStrideController =\n      input.add(guiState.input, 'outputStride', outputStrideArray);\n
outputStrideController.onChange(function(outputStride) {\n      state.changingStride = true;\n\n      guiState.input.outputStride = +outputStride;\n    });\n  }\n\n  // Updates internal resolution\n  // Internal resolution:
Internally, this parameter affects the height and\n  // width of the layers in the neural network. The higher the value
of the\n  // internal resolution the better the accuracy but slower the speed.\n  let internalResolutionController =
null;\n  function updateGuiInternalResolution(\n    internalResolution,\n    internalResolutionArray,\n  ) {\n    if

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(internalResolutionController) {\n  internalResolutionController.remove();\n }\n
guiState.input.internalResolution = internalResolution;\n  internalResolutionController = input.add(\n
guiState.input, 'internalResolution', internalResolutionArray);\n
internalResolutionController.onChange(function(internalResolution) {\n  guiState.input.internalResolution =
internalResolution;\n  });\n }\n\n // Updates depth multiplier\n // Multiplier: this parameter affects the number of
feature map channels\n // in the MobileNet. The higher the value, the higher the accuracy but\n // slower the speed,
the lower the value the faster the speed but lower\n // the accuracy.\n let multiplierController = null;\n function
updateGuiMultiplier(multiplier, multiplierArray) {\n  if (multiplierController) {\n
multiplierController.remove();\n }\n  guiState.input.multiplier = multiplier;\n  multiplierController =\n
input.add(guiState.input, 'multiplier', multiplierArray);\n  multiplierController.onChange(function(multiplier) {\n
state.changingMultiplier = true;\n  guiState.input.multiplier = +multiplier;\n  });\n }\n\n // updates quantBytes\n
// QuantBytes: this parameter affects weight quantization in the ResNet50\n // model. The available options are 1
byte, 2 bytes, and 4 bytes. The\n // higher the value, the larger the model size and thus the longer the\n // loading
time, the lower the value, the shorter the loading time but\n // lower the accuracy.\n let quantBytesController =
null;\n function updateGuiQuantBytes(quantBytes, quantBytesArray) {\n  if (quantBytesController) {\n
quantBytesController.remove();\n }\n  guiState.quantBytes = +quantBytes;\n  guiState.input.quantBytes =
+quantBytes;\n  quantBytesController =\n  input.add(guiState.input, 'quantBytes', quantBytesArray);\n
quantBytesController.onChange(function(quantBytes) {\n  state.changingQuantBytes = true;\n
guiState.input.quantBytes = +quantBytes;\n  });\n }\n\n function updateGuiInputSection() {\n  if
(guiState.input.architecture === 'MobileNetV1') {\n  updateGuiInternalResolution(\n
defaultMobileNetInternalResolution,\n    ['low', 'medium', 'high', 'full']);\n
updateGuiOutputStride(defaultMobileNetStride, [8, 16]);\n  updateGuiMultiplier(defaultMobileNetMultiplier,
[0.50, 0.75, 1.0])\n  } else { // guiState.input.architecture === 'ResNet50'\n  updateGuiInternalResolution(\n
defaultResNetInternalResolution, ['low', 'medium', 'high', 'full']);\n
updateGuiOutputStride(defaultResNetStride, [32, 16]);\n  updateGuiMultiplier(defaultResNetMultiplier, [1.0]);\n
}\n  updateGuiQuantBytes(defaultQuantBytes, [1, 2, 4]);\n }\n\n // Architecture: there are a few PoseNet models
varying in size and\n // accuracy. 1.01 is the largest, but will be the slowest. 0.50 is the\n // fastest, but least
accurate.\n architectureController =\n  input.add(guiState.input, 'architecture', ['ResNet50', 'MobileNetV1']);\n
guiState.architecture = guiState.input.architecture;\n  architectureController.onChange(function(architecture) {\n //
if architecture is ResNet50, then show ResNet50 options\n  state.changingArchitecture = true;\n
guiState.input.architecture = architecture;\n  updateGuiInputSection();\n });\n\n updateGuiInputSection();\n
input.open()\n\n const estimateController =\n  gui.add(guiState, 'estimate', ['segmentation', 'partmap']);\n\n let
segmentation = gui.addFolder('Segmentation');\n  segmentation.add(guiState.segmentation, 'segmentationThreshold',
0.0, 1.0);\n  const segmentationEffectController =\n  segmentation.add(guiState.segmentation, 'effect', ['mask',
'bokeh']);\n\n let multiPersonDecoding = gui.addFolder('MultiPersonDecoding');\n  multiPersonDecoding.add(\n
guiState.multiPersonDecoding, 'maxDetections', 0, 20, 1);\n  multiPersonDecoding.add(\n
guiState.multiPersonDecoding, 'scoreThreshold', 0.0, 1.0);\n
multiPersonDecoding.add(guiState.multiPersonDecoding, 'nmsRadius', 0, 30, 1);\n  multiPersonDecoding.add(\n
guiState.multiPersonDecoding, 'numKeypointForMatching', 1, 17, 1);\n  multiPersonDecoding.add(\n
guiState.multiPersonDecoding, 'refineSteps', 1, 10, 1);\n  multiPersonDecoding.open();\n\n
algorithmController.onChange(function(value) {\n  switch (guiState.algorithm) {\n  case 'single-person':\n
multiPersonDecoding.close();\n  singlePersonDecoding.open();\n  break;\n  case 'multi-person':\n
singlePersonDecoding.close();\n  multiPersonDecoding.open();\n  break;\n  }\n });\n\n let
darknessLevel;\n let bokehBlurAmount;\n let edgeBlurAmount;\n let maskBlurAmount;\n let
maskBackground;\n\n segmentationEffectController.onChange(function(effectType) {\n  if (effectType ===
'mask') {\n  if (bokehBlurAmount) {\n  bokehBlurAmount.remove();\n }\n  if (edgeBlurAmount) {\n
edgeBlurAmount.remove();\n }\n  darknessLevel =\n  segmentation.add(guiState.segmentation, 'opacity',
0.0, 1.0);\n  maskBlurAmount = segmentation.add(guiState.segmentation, 'maskBlurAmount')\n

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.min(0)\n                .max(20)\n                .step(1);\n    maskBackground =\nsegmentation.add(guiState.segmentation, 'maskBackground');\n    } else if (effectType === 'bokeh') {\n    if (darknessLevel) {\n    darknessLevel.remove();\n    }\n    if (maskBlurAmount) {\n    maskBlurAmount.remove();\n    }\n    if (maskBackground) {\n    maskBackground.remove();\n    }\n    bokehBlurAmount = segmentation\n                .add(\n                guiState.segmentation,\n                'backgroundBlurAmount',\n                )\n                .min(1)\n                .max(20)\n                .step(1);\n    edgeBlurAmount = segmentation.add(guiState.segmentation, 'edgeBlurAmount')\n    .min(0)\n    .max(20)\n    .step(1);\n    });\n    // manually set the effect so that the options are shown.\n    segmentationEffectController.setValue(guiState.segmentation.effect);\n\n    let partMap = gui.addFolder('Part Map');\n    partMap.add(guiState.partMap, 'segmentationThreshold', 0.0, 1.0);\n    partMap.add(\n    guiState.partMap, 'effect', ['partMap', 'pixelation', 'blurBodyPart']);\n    partMap.add(guiState.partMap, 'opacity', 0.0, 1.0);\n    partMap.add(guiState.partMap, 'colorScale', Object.keys(partColorScales))\n    .onChange(colorScale => {\n    setShownPartColorScales(colorScale);\n    });\n    setShownPartColorScales(guiState.partMap.colorScale);\n    partMap.add(guiState.partMap, 'blurBodyPartAmount').min(1).max(20).step(1);\n    partMap.add(guiState.partMap, 'bodyPartEdgeBlurAmount')\n    .min(1)\n    .max(20)\n    .step(1);\n    partMap.open();\n\n    estimateController.onChange(function(estimationType) {\n    if (estimationType === 'segmentation') {\n    segmentation.open();\n    partMap.close();\n    document.getElementById('colors').style.display = 'none';\n    } else {\n    segmentation.close();\n    partMap.open();\n    document.getElementById('colors').style.display = 'inline-block';\n    }\n    });\n\n    gui.add(guiState, 'showFps').onChange(showFps => {\n    if (showFps) {\n    document.body.appendChild(stats.dom);\n    } else {\n    document.body.removeChild(stats.dom);\n    }\n    });\n\n    function setShownPartColorScales(colorScale) {\n    const colors = document.getElementById('colors');\n    colors.innerHTML = '';\n\n    const partColors = partColorScales[colorScale];\n    const partNames = bodyPix.PART_CHANNELS;\n\n    for (let i = 0; i < partColors.length; i++) {\n    const partColor = partColors[i];\n    const child = document.createElement('li');\n    child.innerHTML = `<div class='color' style='background-color:rgb(${partColor[0]},${partColor[1]},${partColor[2]})` ></div>`;\n    colors.appendChild(child);\n    }\n    }\n\n    // **\n    * Sets up a frames per second panel on the top-left of the window\n    *\n    function setupFPS() {\n    stats.showPanel(0); // 0: fps, 1: ms, 2: mb, 3+: custom\n    if (guiState.showFps) {\n    document.body.appendChild(stats.dom);\n    }\n    }\n\n    async function estimateSegmentation() {\n    let multiPersonSegmentation = null;\n    switch (guiState.algorithm) {\n    case 'multi-person-instance':\n    return await state.net.segmentMultiPerson(state.video, {\n    internalResolution: guiState.input.internalResolution,\n    segmentationThreshold: guiState.segmentation.segmentationThreshold,\n    maxDetections: guiState.multiPersonDecoding.maxDetections,\n    scoreThreshold: guiState.multiPersonDecoding.scoreThreshold,\n    nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n    numKeypointForMatching: guiState.multiPersonDecoding.numKeypointForMatching,\n    refineSteps: guiState.multiPersonDecoding.refineSteps\n    });\n    case 'person':\n    return await state.net.segmentPerson(state.video, {\n    internalResolution: guiState.input.internalResolution,\n    segmentationThreshold: guiState.segmentation.segmentationThreshold,\n    maxDetections: guiState.multiPersonDecoding.maxDetections,\n    scoreThreshold: guiState.multiPersonDecoding.scoreThreshold,\n    nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n    });\n    default:\n    break;\n    });\n    return multiPersonSegmentation;\n    }\n\n    async function estimatePartSegmentation() {\n    switch (guiState.algorithm) {\n    case 'multi-person-instance':\n    return await state.net.segmentMultiPersonParts(state.video, {\n    internalResolution: guiState.input.internalResolution,\n    segmentationThreshold: guiState.segmentation.segmentationThreshold,\n    maxDetections: guiState.multiPersonDecoding.maxDetections,\n    scoreThreshold: guiState.multiPersonDecoding.scoreThreshold,\n    nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n    numKeypointForMatching: guiState.multiPersonDecoding.numKeypointForMatching,\n    refineSteps: guiState.multiPersonDecoding.refineSteps\n    });\n    case 'person':\n    return await

```

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state.net.segmentPersonParts(state.video, {\n    internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n    maxDetections:\n
guiState.multiPersonDecoding.maxDetections,\n    scoreThreshold:\n
guiState.multiPersonDecoding.scoreThreshold,\n    nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
});\n default:\n    break;\n };\n return multiPersonPartSegmentation;\n}\n\nfunction\n
drawPoses(personOrPersonPartSegmentation, flipHorizontally, ctx) {\n if\n
(Array.isArray(personOrPersonPartSegmentation)) {\n
personOrPersonPartSegmentation.forEach(personSegmentation => {\n    let pose = personSegmentation.pose;\n
if (flipHorizontally) {\n    pose = bodyPix.flipPoseHorizontal(pose, personSegmentation.width);\n    }\n
drawKeypoints(pose.keypoints, 0.1, ctx);\n    drawSkeleton(pose.keypoints, 0.1, ctx);\n    });\n } else {\n
personOrPersonPartSegmentation.allPoses.forEach(pose => {\n    if (flipHorizontally) {\n    pose =\n
bodyPix.flipPoseHorizontal(\n        pose, personOrPersonPartSegmentation.width);\n    }\n
drawKeypoints(pose.keypoints, 0.1, ctx);\n    drawSkeleton(pose.keypoints, 0.1, ctx);\n    });\n }\n}\n\nasync\n
function loadBodyPix() {\n toggleLoadingUI(true);\n state.net = await bodyPix.load({\n architecture:\n
guiState.input.architecture,\n    outputStride: guiState.input.outputStride,\n    multiplier: guiState.input.multiplier,\n
quantBytes: guiState.input.quantBytes\n });\n toggleLoadingUI(false);\n }\n\n/**\n * Feeds an image to BodyPix to\n
estimate segmentation - this is where the\n * magic happens. This function loops with a requestAnimationFrame\n
method.\n */\nfunction segmentBodyInRealTime() {\n const canvas = document.getElementById('output');\n //\n
since images are being fed from a webcam\n\n async function bodySegmentationFrame() {\n // if changing the\n
model or the camera, wait a second for it to complete\n // then try again.\n if (state.changingArchitecture ||\n
state.changingMultiplier ||\n    state.changingCamera || state.changingStride ||\n    state.changingQuantBytes)\n
{\n    console.log('load model...');\n    loadBodyPix();\n    state.changingArchitecture = false;\n
state.changingMultiplier = false;\n    state.changingStride = false;\n    state.changingQuantBytes = false;\n } }\n\n
// Begin monitoring code for frames per second\n stats.begin();\n\n const flipHorizontally =\n
guiState.flipHorizontal;\n\n switch (guiState.estimate) {\n case 'segmentation':\n    const\n
multiPersonSegmentation = await estimateSegmentation();\n    switch (guiState.segmentation.effect) {\n
case 'mask':\n        const ctx = canvas.getContext('2d');\n        const foregroundColor = {r: 255, g: 255, b: 255,\n
a: 255};\n        const backgroundColor = {r: 0, g: 0, b: 0, a: 255};\n        const mask = bodyPix.toMask(\n
multiPersonSegmentation, foregroundColor, backgroundColor,\n            true);\n        bodyPix.drawMask(\n
canvas, state.video, mask, guiState.segmentation.opacity,\n
guiState.segmentation.maskBlurAmount, flipHorizontally);\n        drawPoses(multiPersonSegmentation,\n
flipHorizontally, ctx);\n        break;\n case 'bokeh':\n        bodyPix.drawBokehEffect(\n            canvas,\n
state.video, multiPersonSegmentation,\n            +guiState.segmentation.backgroundBlurAmount,\n
guiState.segmentation.edgeBlurAmount, flipHorizontally);\n        break;\n    }\n\n break;\n case\n
'partmap':\n    const ctx = canvas.getContext('2d');\n    const multiPersonPartSegmentation = await\n
estimatePartSegmentation();\n    const coloredPartImageData = bodyPix.toColoredPartMask(\n
multiPersonPartSegmentation,\n        partColorScales[guiState.partMap.colorScale]);\n\n    const\n
maskBlurAmount = 0;\n    switch (guiState.partMap.effect) {\n case 'pixelation':\n        const\n
pixelCellWidth = 10.0;\n        bodyPix.drawPixelatedMask(\n            canvas, state.video,\n
coloredPartImageData,\n            guiState.partMap.opacity, maskBlurAmount, flipHorizontally,\n
pixelCellWidth);\n        break;\n case 'partMap':\n        bodyPix.drawMask(\n            canvas,\n
state.video, coloredPartImageData, guiState.opacity,\n            maskBlurAmount, flipHorizontally);\n
break;\n case 'blurBodyPart':\n        const blurBodyPartIds = [0, 1];\n        bodyPix.blurBodyPart(\n
canvas, state.video, multiPersonPartSegmentation,\n            blurBodyPartIds,\n
guiState.partMap.blurBodyPartAmount,\n            guiState.partMap.edgeBlurAmount, flipHorizontally);\n    }\n
drawPoses(multiPersonPartSegmentation, flipHorizontally, ctx);\n    break;\n default:\n    break;\n }\n\n
}\n\n // End monitoring code for frames per second\n stats.end();\n\n\n
requestAnimationFrame(bodySegmentationFrame);\n } }\n\n bodySegmentationFrame();\n }\n\n\n/**\n * Kicks off the

```



```
demo.\n *\nexport async function bindPage() {\n // Load the BodyPix model weights with architecture 0.75\n await loadBodyPix();\n document.getElementById('loading').style.display = 'none';\n document.getElementById('main').style.display = 'inline-block';\n\n await loadVideo(guiState.camera);\n\n let\n cameras = await getVideoInputs();\n\n setupFPS();\n setupGui(cameras);\n\n\n segmentBodyInRealTime();\n}\n\nnavigator.getUserMedia = navigator.getUserMedia ||\n navigator.webkitGetUserMedia || navigator.mozGetUserMedia;\n\n// kick off the demo\nbindPage();\n"}
```

Found in path(s):

```
* /opt/cola/permits/1234600288_1638275149.74/0/tensorflow-models-zip/@tensorflow-models/body-pix/demos/dist/demos.ab0c720b.js.map
```

1.259 util-linux 2.20.0

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NR START END SECTORS SIZE NAME UUID

1 32 7679 7648 3.7M 8f8378c0-01
2 7680 16383 8704 4.3M 8f8378c0-02
5 7936 12799 4864 2.4M
6 12544 16127 3584 1.8M

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Version 3, 29 June 2007

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```
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```
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1.263 libiconv 1.14

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This option is useful when you wish to copy part of the code of

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```
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```

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```
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```

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GNU LIBICONV - character set conversion library

This library provides an iconv() implementation, for use on systems which
don't have one, or whose implementation cannot convert from/to Unicode.

It provides support for the encodings:

European languages

```
ASCII, ISO-8859-{1,2,3,4,5,7,9,10,13,14,15,16},  
KOI8-R, KOI8-U, KOI8-RU,  
CP{1250,1251,1252,1253,1254,1257}, CP{850,866,1131},  
Mac{Roman,CentralEurope,Iceland,Croatian,Romania},  
Mac{Cyrillic,Ukraine,Greek,Turkish},  
Macintosh
```

Semitic languages

ISO-8859-{6,8}, CP{1255,1256}, CP862, Mac{Hebrew,Arabic}

Japanese

EUC-JP, SHIFT_JIS, CP932, ISO-2022-JP, ISO-2022-JP-2, ISO-2022-JP-1

Chinese

EUC-CN, HZ, GBK, CP936, GB18030, EUC-TW, BIG5, CP950, BIG5-HKSCS,
BIG5-HKSCS:2004, BIG5-HKSCS:2001, BIG5-HKSCS:1999, ISO-2022-CN,
ISO-2022-CN-EXT

Korean

EUC-KR, CP949, ISO-2022-KR, JOHAB

Armenian

ARMSCII-8

Georgian

Georgian-Academy, Georgian-PS

Tajik

KOI8-T

Kazakh

PT154, RK1048

Thai

ISO-8859-11, TIS-620, CP874, MacThai

Laotian

MuleLao-1, CP1133

Vietnamese

VISCII, TCVN, CP1258

Platform specifics

HP-ROMAN8, NEXTSTEP

Full Unicode

UTF-8

UCS-2, UCS-2BE, UCS-2LE

UCS-4, UCS-4BE, UCS-4LE

UTF-16, UTF-16BE, UTF-16LE

UTF-32, UTF-32BE, UTF-32LE

UTF-7

C99, JAVA

Full Unicode, in terms of 'uint16_t' or 'uint32_t'

(with machine dependent endianness and alignment)

UCS-2-INTERNAL, UCS-4-INTERNAL

Locale dependent, in terms of 'char' or 'wchar_t'

(with machine dependent endianness and alignment, and with OS and
locale dependent semantics)

char, wchar_t

The empty encoding name "" is equivalent to "char": it denotes the
locale dependent character encoding.

When configured with the option --enable-extra-encodings, it also provides
support for a few extra encodings:

European languages

CP{437,737,775,852,853,855,857,858,860,861,863,865,869,1125}

Semitic languages

CP864

Japanese

EUC-JISX0213, Shift_JISX0213, ISO-2022-JP-3

Chinese

BIG5-2003 (experimental)

Turkmen

TDS565

Platform specifics

ATARIST, RISCOS-LATIN1

It can convert from any of these encodings to any other, through Unicode conversion.

It has also some limited support for transliteration, i.e. when a character cannot be represented in the target character set, it can be approximated through one or several similarly looking characters. Transliteration is activated when "//TRANSLIT" is appended to the target encoding name.

libiconv is for you if your application needs to support multiple character encodings, but that support lacks from your system.

Installation

As usual for GNU packages:

```
$ ./configure --prefix=/usr/local
```

```
$ make
```

```
$ make install
```

After installing GNU libiconv for the first time, it is recommended to recompile and reinstall GNU gettext, so that it can take advantage of libiconv.

On systems other than GNU/Linux, the iconv program will be internationalized only if GNU gettext has been built and installed before GNU libiconv. This means that the first time GNU libiconv is installed, we have a circular dependency between the GNU libiconv and GNU gettext packages, which can be resolved by building and installing either

- first libiconv, then gettext, then libiconv again,

or (on systems supporting shared libraries, excluding AIX)

- first gettext, then libiconv, then gettext again.

Recall that before building a package for the second time, you need to erase the traces of the first build by running "make distclean".

This library can be built and installed in two variants:

- The library mode. This works on all systems, and uses a library 'libiconv.so' and a header file '<iconv.h>'. (Both are installed through "make install".)

To use it, simply #include <iconv.h> and use the functions.

To use it in an autoconfiguring package:

- If you don't use automake, append m4/iconv.m4 to your aclocal.m4 file.
- If you do use automake, add m4/iconv.m4 to your m4 macro repository.
- Add to the link command line of libraries and executables that use the functions the placeholder @LIBICONV@ (or, if using libtool for the link, @LTLIBICONV@). If you use automake, the right place for these additions are the *_LDADD variables.

Note that 'iconv.m4' is also part of the GNU gettext package, which installs it in /usr/local/share/aclocal/iconv.m4.

- The libc plug/override mode. This works on GNU/Linux, Solaris and OSF/1 systems only. It is a way to get good iconv support without having glibc-2.1.

It installs a library 'preloadable_libiconv.so'. This library can be used with LD_PRELOAD, to override the iconv* functions present in the C library.

On GNU/Linux and Solaris:

```
$ export LD_PRELOAD=/usr/local/lib/preloadable_libiconv.so
```

On OSF/1:

```
$ export _RLD_LIST=/usr/local/lib/preloadable_libiconv.so:DEFAULT
```

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This code is derived from section 17.1 of Applied Cryptography, second edition, which describes a stream cipher allegedly compatible with RSA Labs "RC4" cipher (the actual description of which is a trade secret). The same algorithm is used as a stream cipher called "arcfour" in Tatu Ylonen's ssh package.

Here the stream cipher has been modified always to include the time when initializing the state. That makes it impossible to regenerate the same random sequence twice, so this can't be used for encryption, but will generate good random numbers.

RC4 is a registered trademark of RSA Laboratories.

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This code implements the MD5 message-digest algorithm.

The algorithm is due to Ron Rivest. This code was written by Colin Plumb in 1993, no copyright is claimed. This code is in the public domain; do with it what you wish.

Equivalent code is available from RSA Data Security, Inc. This code has been tested against that, and is equivalent, except that you don't need to include two pages of legalese with every copy.

To compute the message digest of a chunk of bytes, declare an MD5Context structure, pass it to MD5Init, call MD5Update as needed on buffers full of bytes, and then call MD5Final, which will fill a supplied 16-byte array with the digest.

--

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<phk@login.dkuug.dk> wrote this file. As long as you retain this notice you can do whatever you want with this stuff. If we meet some day, and you think this stuff is worth it, you can buy me a beer in return. Poul-Henning Kamp

1.267 golang 1.15.13

1.267.1 Available under license :

```
# This is the official list of people who can contribute
# (and typically have contributed) code to the Go repository.
# The AUTHORS file lists the copyright holders; this file
# lists people. For example, Google employees are listed here
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# http://code.google.com/legal/individual-cla-v1.0.html
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#
# The agreement for individuals can be filled out on the web.
#
# Names should be added to this file like so:
# Individual's name <submission email address>
# Individual's name <submission email address> <email2> <emailN>
#
# An entry with multiple email addresses specifies that the
# first address should be used in the submit logs and
# that the other addresses should be recognized as the
# same person when interacting with Gerrit.
```

Please keep the list sorted.

Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Beitch <aaronb@arista.com>
Aaron Bieber <deftly@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Patterson <tenderlove@ruby-lang.org>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Shelton <aashelt90@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Williams <pwnfactory@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Harindar <aditya.harindar@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>
Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Delorme <adrien.delorme@icloud.com>
Adrien Petel <peteladrien@gmail.com>
Acio Jnior <aeciodantasjunior@gmail.com>
Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmetb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>

Ahmy Yulrizka <yulrizka@gmail.com>
Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <aindurti@gmail.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>
Albert Nigmatzianov <albertnigma@gmail.com>
Albert Strasheim <fullung@gmail.com>
Albert Teoh <albert.teoh@gmail.com>
Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Alec Benzer <alec.benzer@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Buchanan <buchanae@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Gaynor <alex@alloy.us>
Alex Harford <alex.harford@saucelabs.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>
Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex Sergeyev <abc@alexsergeyev.com>
Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alex Zhirov <azhirov@google.com>
Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Greim <alexxx@iltempo.de>

Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumpem.de>
Alexander Nohe <alex.nohe427@gmail.com>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandr Mayorskiy <a.mayorskiy@corp.mail.ru>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexey Semenyuk <alexsemenyuk88@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Farooq <ali.farooq0@pm.me>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amarjeet Anand <amarjeetanandsingh@gmail.com>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>

An Long <aisk1988@gmail.com>
An Xiao <hac@zju.edu.cn>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andr Martins <aanm90@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Enshin <b1os@bk.ru>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew G. Morgan <agm@google.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Louis <alouis@digitalocean.com>
Andrew Lutomirski <andy@luto.us>
Andrew Medvedev <andrew.y.medvedev@gmail.com>
Andrew Pilloud <andrewpilloud@igneoussystems.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stormont <astormont@racktopsystems.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>

Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Pan <panjf2000@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andy Wang <cbeuw.andy@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Annirudh Prasad <annirudh@wandb.com>
Anschel Schaffer-Cohen <anschelse@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <alidity@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Anton Kuklin <anton.a.kuklin@gmail.com>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Huete Jimenez <tuxillo@quantumachine.net>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Anze Kolar <me@akolar.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>

Aram Hvrneanu <aram@mgk.ro>
Araragi Hokuto <kanseihonbucho@protonmail.com>
Arash Bina <arash@arash.io>
Arda Gl <ardaguclu@gmail.com>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Alekseev <artem.alekseev@intel.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Aurlio A. Heckert <aurium@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayan George <ayan@ayan.net>
Ayanamist Yang <ayanamist@gmail.com>
Ayke van Laethem <aykevanlaethem@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Barnaby Keene <accounts@southcla.ws>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>

Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Ben Toews <mastahyeti@gmail.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benjamin Wuethrich <benjamin.wuethrich@gmail.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbarath91@gmail.com>
Bhavin Gandhi <bhavin7392@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Billy Zaelani Malik <m.billyzaelani@gmail.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob McNaughton <bobmcn@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boqin Qin <bobbqqin@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>

Brad Erickson <bderickson@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradford Lamson-Scribner <brad.lamson@gmail.com>
Bradley Falzon <brad@teambrad.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Philips <brandon@ifup.org>
Brandon Ryan <bjryan19@gmail.com>
Brayden Cloud <bcloud@google.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian Falk <falk@logicparty.org>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkennedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>

Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Amedee <carlos@golang.org>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Iriarte <ciriarte@gmail.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Changkun Ou <hi@changkun.us>
Channing Kimble-Brown <channing@golang.org>
Chao Xu <xuchao@google.com>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Chauncy Cullitan <chauncyc@google.com>
Chen Zhihan <energiehund@gmail.com>
Cherry Zhang <cherryz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Le Roy <brompwnie@users.noreply.github.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>

Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Loessl <cloessl+github@gmail.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clment Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Clint J. Edwards <clint.j.edwards@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Corne van der Plas <vdplas@gmail.com>

Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daisuke Suzuki <daisuzu@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damien@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Scales <danscales@google.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Kumor <rdkumor@gmail.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mangum <georgedanielmangum@gmail.com>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danish Dua <danishdua@google.com>
Danish Prakash <grafitykoncept@gmail.com>

Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Bond <davidsbond93@gmail.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Carter <fresco.raja@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Golden <david@autopragmatic.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>

David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Eigenmann <7621705+decanus@users.noreply.github.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Isaev <idenx@yandex.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvdudd Jadhav <dhruvdudd.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>

Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Doga Fincan <doga@icloud.com>
Domas Tamauskas <puerdomus@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duco van Amstel <duco.vanamstel@gmail.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Ed Schouten <ed@nuxi.nl>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Eduardo Villaseor <evillasrmx@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>

Elliot Morrison-Reed <elliotmr@gmail.com>
Ellison Leao <ellisonleao@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Emrecan Bati <emrecanbati@gmail.com>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Biggers <ebiggers@google.com>
Eric Brown <browne@vmware.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rutherford <erutherford@gmail.com>
Eric Rykwaldler <e.rykwaldler@gmail.com>
Erick Tryzelaar <etryzelaar@google.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Formanenko <mo4islona@gmail.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>

Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Kulikov <tuxuls@gmail.com>
Evgeniy Polyakov <zbr@ioremap.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Cornelius <9767036+fcornelius@users.noreply.github.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Ferenc Szabo <frncmx@gmail.com>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <fl@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>

Frederik Ring <frederik.ring@gmail.com>
Frederik Zipp <fzipp@gmx.de>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fujimoto Kyosuke <kyoro.f@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Rosenhouse <rosenhouse@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@aurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Gawen Arab <gawen.arab@c.zen.ly>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Hartzell <hartzell@alerce.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Gert Cuykens <gert.cuykens@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Ghazni Nattarshah <ghazni.nattarshah@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>

Giovanni Bajo <rasky@develer.com>
GitHub User @aca (50316549) <acadx0@gmail.com>
GitHub User @ajnirp (1688456) <ajnirp@users.noreply.github.com>
GitHub User @ajz01 (4744634) <ajzdenek@gmail.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andig (184815) <cpuidle@gmx.de>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chainhelen (7046329) <chainhelen@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @cncal (23520240) <flycalvin@qq.com>
GitHub User @DQNEO (188741) <dqneo@gmail.com>
GitHub User @Dreamacro (8615343) <chuainian@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @fatedier (7346661) <fatedier@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @geedchin (11672310) <geedchin@gmail.com>
GitHub User @GrigoriyMikhalkin (3637857) <grigoriymikhalkin@gmail.com>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @jinmiaoluo (39730824) <jinmiaoluo@icloud.com>
GitHub User @jobbrown (6345470) <msshane2008@gmail.com>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @ly303550688 (11519839) <yang.liu636@gmail.com>
GitHub User @madiganz (18340029) <zacharywmadigan@gmail.com>
GitHub User @maltalex (10195391) <code@bit48.net>
GitHub User @Matts966 (28551465) <Matts966@users.noreply.github.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @nu50218 (40682920) <nu_ll@icloud.com>
GitHub User @OlgaVIPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @po3rin (29445112) <abctail30@gmail.com>
GitHub User @pokutuna (57545) <popopopokutuna@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @ramenjuniti (32011829) <ramenjuniti@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Chorama194@gmail.com>

GitHub User @skanehira (7888591) <sho19921005@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @tennashi (10219626) <tennashio@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <utkarsh.extc@gmail.com>
GitHub User @witchard (4994659) <witchard@hotmail.co.uk>
GitHub User @yah01 (12216890) <kagaminehuan@gmail.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @zikaeroh (48577114) <zikaeroh@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Gregory Petrosyan <gregory.petrosyan@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Gnter Noack <gnoack@google.com>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>

Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hasit Bhatt <hasit.p.bhatt@gmail.com>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hiromichi Ema <ema.hiro@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horacio Duran <horacio.duran@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Howard Zhang <howard.zhang@arm.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Huan Du <i@huandu.me>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>

Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Hyoyoung Chang <hyoyoung@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Ignacio Hagopian <jsign.uy@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Sineelnikov <sidhmangh@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irbe Krumina <irbekrm@gmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Isfan Azhabil <isfanazhabil@gmail.com>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchiy <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Trubach <mr.trubach@icloud.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>

Jaap Aarts <jaap.aarts1@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Kaczmarzyk <jakubk@mit.edu>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
Jamal Carvalho <jamal.a.carvalho@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>

Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Allard <jaredallard@users.noreply.github.com>
Jared Culp <jculp14@gmail.com>
Jaroslav Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Baker <jason-baker@users.noreply.github.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jdrzej Szczepaniak <jbszczepaniak@gmail.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>

Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Faller <jeremy@golang.org>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jia Zhan <jzhan@uber.com>
Jiacai Liu <jiacai2050@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jie Ma <jienius@outlook.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jjiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>

Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppey@google.com>
Johan Jansson <johan.jansson@iki.fi>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John McCabe <john@johnmccabe.net>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Papandriopoulos <jpap.code@gmail.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jon Johnson <jonjohnson@google.com>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>

Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kieft <ikojba@gmail.com> <joop@kiefte.net>
Jordan Christiansen <xordspar0@gmail.com>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jorge L. Fatta <jorge.fatta@auth0.com>
Jos Visser <josv@google.com>
Josa Gesell <josa@gesell.me>
Jose Luis Vzquez Gonzlez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Baum <joshbaum@google.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Bezaleel Abednego <joshua.bezaleel@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcJoshuaChase@gmail.com>
Joshua Crowgey <jcrowgey@uw.edu>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhau <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>

Julian Tibble <julian.tibble@gmail.com>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Jun Zhang <jim.zoumo@gmail.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kalman Bekesi <kalmanb@google.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Kanta Ebihara <kantaebihara@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katharine Berry <ktbry@google.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keisuke Kishimoto <keisuke.kishimoto@gmail.com>
Keith Ball <inflatablewoman@gmail.com>

Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelly Heller <pestophagous@gmail.com>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Kerollos Magdy <kerolloz@yahoo.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevan Swanberg <kevswanberg@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kvin Dunglas <dunglas@gmail.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Keyan Pishdadian <kpishdadian@gmail.com>
Kezhu Wang <kezhuw@gmail.com>
Khosrow Moossavi <khos2ow@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Korotaev <kirillx@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirill Tatchihin <kirabsuir@gmail.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Koki Tomoshige <tomocy.dev@gmail.com>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>

Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Koya IWAMURA <kiwamura0314@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kush Patel <kush.patel@hootsuite.com>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Nusbaum <kyle@datadog.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kyrylo Silin <silin@kyrylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lannm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Liam Haworth <liam@haworth.id.au>

Lily Chung <lilithkchung@gmail.com>
Lion Yang <lion@aosc.xyz>
Liz Rice <liz@lizrice.com>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Brun <lorenz@brun.one>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luke Young <bored-engineer@users.noreply.github.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>

Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Sanmiquel <marcsanmiquel@gmail.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Weiner <marcus.weiner@gmail.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Mariano Cano <mariano@smallstep.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Kungla <marko.kungla@gmail.com>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Asquino <martin.asquino@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>

Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Masaya Watanabe <sfbgwm30@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdlayher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>

Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Pugachev <pugachev.mm@gmail.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com> <mzh@golangcn.org>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszczek <mknyszczek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorner.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufl <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>

Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgrber <mteichgraeber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Micha owicki <mlowicki@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Acero <acero@google.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>

Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Fesenko <proggga@gmail.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milan Patel <bicelot3@gmail.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Mohit Verma <vmohit.93@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moritz Fain <moritz@fain.io>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mukesh Sharma <sharma.mukesh439@gmail.com>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Naman Aggarwal <aggarwal.nam@gmail.com>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactus@gmail.com>
Nathan Dias <nathan.dias@orijtech.com>
Nathan Fiscaletti <nathan.fiscaletti@vrazo.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>

Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neeilan Selvalingam <neeilan96@gmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Gillmann <nikita@n0.is> <ng0@n0.is>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Nikita Vanyasin <nikita.vanyasin@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nikson Kanti Paul <nikson.sust@gmail.com>
Nils Larsgrd <nilsmagnus@gmail.com>

Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noah Goldman <noahg34@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Nuno Cruces <ncruces@users.noreply.github.com>
Obeyda Djefal <djefobey@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Powell <oliverpowell84@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogsoft.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryamoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Caderno <kaderno@gmail.com>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorphus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Panos Georgiadis <pgeorgiadis@suse.de>
Pantelis Sampaziotis <psampaz@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Paschalis Tsilias <paschalis.tsilias@gmail.com>
Pasi Thkp <pasi.tahkapaa@gmail.com>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>

Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul D. Weber <x0bdev@gmail.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Paulo Gomes <paulo.gomes.uk@gmail.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Pei Xian Chee <luciolas1991@gmail.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Dambovaliev <petar.atanasov.1987@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>

Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.borgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Carru <pierre.carru@eshard.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Polina Osadcha <polliosa@google.com>
Pontus Leitzler <leitzler@gmail.com>
Povilas Versockas <p.versockas@gmail.com>
Prasanga Siripala <pj@pjebs.com.au>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Agrawal <prashant.a.vjti@gmail.com>
Prashant Varanasi <prashant@prashantv.com>
Praveen Kumar <praveen+git@kumar.in>

Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quey-Liang Kao <s101062801@m101.nthu.edu.tw>
Quinn Slack <sqs@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Ren Ogaki <re.yuz77777@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Ricardo Seriani <ricardo.seriani@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>

Richard Miller <millier.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Richard Ulmer <codesoap@mailbox.org>
Richard Wilkes <wilkes@me.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelmä <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>
Rob Findley <rfindley@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Kuska <rkuska@gmail.com>
Robert Obryk <robryk@gmail.com>
Robert Seseke <rseseke@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Robin Zhong <robin@robinzhong.co>
Rodolfo Carvalho <rhcarvalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Challa <rohan@golang.org>
Rohan Verma <rohanverma2004@gmail.com>
Rohith Ravi <entombedvirus@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Kollr <roman.kollar.0@gmail.com>
Roman Shchekin <mrqtros@gmail.com>

Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Kinsey <rossikinsey@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiui@google.com>
Ruixin Bao <ruixin.bao@ibm.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrdb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Chen <chenxsan@gmail.com>
Sam Cross <samgcdev@gmail.com>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>

Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sardorbek Pulatov <sardorbek.pulatov@outlook.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Ragan <ragansa@fb.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Liao <seankhliao@gmail.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Chlopecki <sebsebmc@gmail.com>
Sebastian Kinne <skinne@google.com>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Lemeshkin <sergeilem@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'SnakE' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Glushchenko <gs serge@gmail.com>
Sergey Ivanov <ser1325@gmail.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>

Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhat Giydiren <serhatgydiren@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shang Jian Ding <sdj3@ncsu.edu>
Shaozhen Ding <dsz0111@gmail.com>
Shaquille Wyan Que <shaqwywan@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <sellott@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zs950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shivashis Padhi <shivashispadhi@gmail.com>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simarpreet Singh <simar@linux.com>
Simon Drake <simondrake1990@gmail.com>
Simon Ferquel <simon.ferquel@docker.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Rozman <simon@rozman.si>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sjoerd Siebinga <sjoerd.siebinga@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Soojin Nam <jsunam@gmail.com>
Sren L. Hansen <soren@linux2go.dk>
Spencer Kocot <spencerkocot@gmail.com>

Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
Srinidhi Kaushik <shrinidhi.kaushik@gmail.com>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimisteve@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littlebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sven Taute <sven.taute@gmail.com>

Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Tadeo Kondrak <me@tadeo.ca>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tams Gulcsi <tgulacsi78@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Qingyun <qingyunha@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddot.x.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
The Hatsune Daishi <nao20010128@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>

Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Symborski <thomas.symborski@gmail.com>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianji Wu <the729@gmail.com>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Mhlmann <muhlemmer@gmail.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timmy Douglas <timmyd983@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Parkin <tom.parkin@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tomas Dabasinskas <tomas@dabasinskas.net>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomohiro Kusumoto <zabio1192@gmail.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>

Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Torben Schinke <torben.schinke@neotos.de>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Ooohry <ooohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tsuji Daishiro <dram.dt.shonan@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tyson Andre <tysonandre775@gmail.com>
Tzach Shabtay <tzachshabtay@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vee Zhang <veezhang@126.com> <veezhang@gmail.com>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>

Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Ville Skytt <ville.skytta@iki.fi>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitaly Zdanevich <zdanevich.vitaly@ya.ru>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vivian Liang <vliang88@gmail.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Evgrafov <evgrafov.vladimir@gmail.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Vojtech Bocek <vbocek@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgrriffel@gmail.com>
Walt Della <walt@javins.net>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Wang Xuerui <git@xen0n.name>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>

Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
William Poussier <william.poussier@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xiangdong Ji <xiangdong.ji@arm.com>
Xing Xing <mikespook@gmail.com>
Xingqiang Bai <bxq2011hust@qq.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Hau <vulxj0j8j8@gmail.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherve@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yannic Bonenberger <contact@yannic-bonenberger.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yaroslav Vorobiov <yar.vorobiov@gmail.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>

Yorman Arias <cixtors@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuichi Kishimoto <yk2220s@gmail.com>
Yuichi Nishiwaki <yuichi.nishiwaki@gmail.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zhang Boyang <zhangboyang.id@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Ziheng Liu <lzhfromustc@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
<a.maksadbek@gmail.com>
<max.faceless.frei@gmail.com>
<hagen1778@gmail.com>
<tbunyk@gmail.com>
<faxriddinjon@gmail.com>
<zs349596@gmail.com>
<bronze1man@gmail.com>
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#  
# Names should be added to this file as:  
#   Name <email address>  
Raul Silvera <rsilvera@google.com>  
Tipp Moseley <tipp@google.com>
```

Hyoun Kyu Cho <netforce@google.com>

Martin Spier <spiermar@gmail.com>

Taco de Wolff <tacodewolff@gmail.com>

Andrew Hunter <andrewhunter@gmail.com>

This source code was written by the Go contributors.

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- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/serviceloader/ServiceFactoryBean.java
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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/SimpleTypeConverter.java
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jar/org/springframework/beans/TypeConverter.java

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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/PropertyAccessorUtils.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/PropertiesFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/BeanClassLoaderAware.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/Problem.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/ListFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/BeanMetadataAttributeAccessor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/ImportDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/DeprecatedBeanWarner.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/RuntimeBeanNameReference.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/ManagedProperties.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/MethodInvokingBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/ListableBeanFactoryExtensions.kt
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/CharArrayPropertyEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/MapFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/DocumentDefaultsDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/BeanWrapper.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/PatternEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/GenericTypeAwarePropertyDescriptor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/SetFactoryBean.java

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- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/BeanDefinitionReaderUtils.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/BeanDefinitionDefaults.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/XmlBeanDefinitionReader.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/PropertiesBeanDefinitionReader.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/ConstructorResolver.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/CachedIntrospectionResults.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/AbstractBeanDefinition.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/ParseState.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/annotation/Lookup.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/DefaultListableBeanFactory.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/annotation/InjectionMetadata.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/SimpleAutowireCandidateResolver.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/BeanFactory.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/YamlProcessor.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/ListableBeanFactory.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/AbstractAutowireCapableBeanFactory.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-

jar/org/springframework/beans/BeanUtils.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/annotation/Value.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/BeanDefinitionValueResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/DefaultSingletonBeanRegistry.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/AutowireCandidateResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/BeanDefinition.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/BeanDefinitionParserDelegate.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/ReaderContext.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/FactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/FactoryBeanRegistrySupport.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/DependencyDescriptor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/GenericTypeAwareAutowireCandidateResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/AbstractBeanFactory.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/BeanWrapperImpl.java

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* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/ZoneIdEditor.java

* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/Scope.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/serviceloader/ServiceListFactoryBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/BeanNameAware.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/UtilNamespaceHandler.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/SmartInstantiationAwareBeanPostProcessor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/URLEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/NamespaceHandlerResolver.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/support/ResourceEditorRegistrar.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/InputStreamEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/parsing/SourceExtractor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/NamedBean.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/ReaderEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/config/BeanDefinitionCustomizer.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/support/ImplicitlyAppearedSingletonException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/BeanInitializationException.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/propertyeditors/FileEditor.java
* /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/NullValueInNestedPathException.java
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- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/SmartInitializingSingleton.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/xml/AbstractSimpleBeanDefinitionParser.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/NotReadablePropertyException.java
- * /opt/cola/permits/1135888101_1613626209.41/0/spring-beans-5-2-8-release-sources-1-jar/org/springframework/beans/factory/annotation/AnnotatedBeanDefinition.java

1.272 libmnl 1.0.3

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```

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```

```
<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice
```

That's all there is to it!

1.273 ehcache-xml 3.8.1

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/*
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 */
```

Found in path(s):

```
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/CacheResourceConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/service/DefaultCacheEventDispatcherConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/CoreServiceCreationConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/service/DefaultSerializerConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/CoreCacheConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/provider/OffHeapDiskStoreProviderConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/multi/XmlMultiConfiguration.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/ServiceCreationConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/XmlConfiguration.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/provider/DefaultSizeOfEngineProviderConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/model/SizeOfEngineLimits.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/model/CacheTemplate.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/service/SimpleCoreServiceConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-
jar/org/ehcache/xml/model/CacheSpec.java
```

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/PooledExecutionServiceConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/CoreServiceConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/ThreadPoolServiceCreationConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCacheLoaderWriterConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/DefaultCopyProviderConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCopierConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/XmlModel.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheDefinition.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/JaxbHelper.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/BaseConfigParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/Expiry.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/ConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/exceptions/XmlConfigurationException.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultResilienceStrategyConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/model/ListenersConfig.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/CacheServiceConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultSizeOfEngineConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/WriteBehindProviderConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/CacheManagerPersistenceConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCacheEventListenerConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/DefaultSerializationProviderConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultWriteBehindConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/SimpleCoreServiceCreationConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/CacheManagerServiceConfigurationParser.java

* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/ServiceConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/ResourceConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/DomUtil.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/service/OffHeapDiskStoreConfigurationParser.java
* /opt/cola/permits/1135872744_1613620816.93/0/ehcache-xml-3-8-1-sources-1-jar/org/ehcache/xml/provider/CacheEventDispatcherFactoryConfigurationParser.java

1.274 rsyslog 7.6.7

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#   Name <email address>
Raul Silvera <rsilvera@google.com>
Tipp Moseley <tipp@google.com>
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```

```
Aamir Khan <syst3m.w0rm@gmail.com>
Aaron Cannon <cannona@fireantproductions.com>
Aaron France <aaron.l.france@gmail.com>
Aaron Jacobs <jacobsa@google.com>
Aaron Kemp <kemp.aaron@gmail.com>
Aaron Stein <aaronstein12@gmail.com>
Aaron Torres <tcboox@gmail.com>
Aaron Zinman <aaron@azinman.com>
Aarti Parikh <aarti.parikh@gmail.com>
Abdullah Al Maruf <mymail.maruf@gmail.com>
Abe Haskins <abeisgreat@abeisgreat.com>
Abhinav Gupta <abhinav.g90@gmail.com>
Adam Azarchs <adam.azarchs@10xgenomics.com>
Adam Bender <abender@google.com>
Adam Eijdenberg <adam@continusec.com>
Adam Harvey <aharvey@php.net>
Adam Kisala <adam.kisala@gmail.com>
Adam Langley <agl@golang.org>
Adam Medzinski <adam.medzinski@gmail.com>
Adam Shannon <adamkshannon@gmail.com>
Adam Sindelar <adamsh@google.com>
Adam Thomason <athomason@gmail.com>
Adam Woodbeck <adam@woodbeck.net>
Adarsh Ravichandran <adarshravichandran91@gmail.com>
Aditya Mukerjee <dev@chimeracoder.net>
Adrian Hesketh <adrianhesketh@hushmail.com>
Adrian Nos <nos.adrian@gmail.com>
Adrian O'Grady <elpollouk@gmail.com>
Adrien Bustany <adrien-xx-google@bustany.org>
Adrien Petel <peteladrien@gmail.com>
```

Acio Jnior <aeciodantasjunior@gmail.com>
Aeneas Rekkas (arekkas) <aeneas@ory.am>
Afanasev Stanislav <phpprogger@gmail.com>
Agis Anastasopoulos <agis.anast@gmail.com>
Agniva De Sarker <agnivade@yahoo.co.in>
Ahmed Wahed <oneofone@gmail.com>
Ahmet Alp Balkan <ahmetb@google.com>
Ahmet Soormally <ahmet@mangomm.co.uk>
Ahmy Yulrizka <yulrizka@gmail.com>
Ahsun Ahmed <ahmed.ahsun@gmail.com>
Aiden Scandella <ai@uber.com>
Ainar Garipov <gugl.zadolbal@gmail.com>
Aishraj Dahal <aishraj@users.noreply.github.com>
Akhil Indurti <contact@akhilindurti.com>
Akihiro Suda <suda.kyoto@gmail.com>
Akshat Kumar <seed@mail.nanosouffle.net>
Al Cutter <al@google.com>
Alan Braithwaite <alan@ipaddr.org>
Alan Donovan <adonovan@google.com>
Alan Shreve <alan@inconshreveable.com>
Albert Nigmatzianov <albertnigma@gmail.com>
Albert Strasheim <fullung@gmail.com>
Albert Teoh <albert.teoh@gmail.com>
Albert Yu <yukinying@gmail.com>
Alberto Bertogli <albertito@blitiri.com.ar>
Alberto Donizetti <alb.donizetti@gmail.com>
Alberto Garca Hierro <alberto@garciahierro.com> <alberto.garcia.hierro@gmail.com>
Aleksa Sarai <cyphar@cyphar.com>
Aleksandar Dezelin <dezelin@gmail.com>
Aleksandr Lukinykh <a.lukinykh@xsolla.com>
Aleksandr Razumov <ar@cydev.ru>
Alekseev Artem <a.artem060@gmail.com>
Alessandro Arzilli <alessandro.arzilli@gmail.com>
Alessandro Baffa <alessandro.baffa@gmail.com>
Alex A Skinner <alex@lx.lc>
Alex Brainman <alex.brainman@gmail.com>
Alex Bramley <abramley@google.com>
Alex Browne <stephenalexbrowne@gmail.com>
Alex Carol <alex.carol.c@gmail.com>
Alex Jin <toalexjin@gmail.com>
Alex Kohler <alexjohnkohler@gmail.com>
Alex Myasoedov <msoedov@gmail.com>
Alex Plugaru <alex@plugaru.org> <alexandru.plugaru@gmail.com>
Alex Schroeder <alex@gnu.org>
Alex Sergeyev <abc@alexsergeyev.com>
Alex Tokarev <aleksator@gmail.com>
Alex Vaghin <crhyme@google.com>
Alexander Demakin <alexander.demakin@gmail.com>

Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Guz <kalimatas@gmail.com>
Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumpen.de>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>

Andr Carvalho <asantostc@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewaact@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Lutomirski <andy@luto.us>
Andrew Pilloud <andrewpilloud@igneoussystems.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>
Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>

Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <ality@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>
Arash Bina <arash@arash.io>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>

Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayanamist Yang <ayanamist@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
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Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>
Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>

Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradley Falzon <brad@teambrod.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Ryan <bjryan19@gmail.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkenedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>

Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>
Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlopedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Channing Kimble-Brown <channing@golang.org>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Cherry Zhang <cherryyz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>

Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>
Chris Marchesi <chrism@vancluevertech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clment Chigot <clement.chigot@atos.net>
Clement Skau <clementska@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>

Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>
Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damien@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruszalek@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>
Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>

Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>
David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>

David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvduddt Jadhav <dhruvduddt.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>
Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Domen Ipavec <domen@ipavec.net>

Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>

Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rykwaldler <e.rykwaldler@gmail.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>
Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Polyakov <zbr@iorem.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>

Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Filip Gruszczyski <gruszczzy@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <francissouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>

Gauthier Jolly <gauthier.jolly@gmail.com>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @frennie (6499251) <mail@rhab.de>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @kazysshr (30496953) <kazysshr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @madiganz (18340029) <zacharymadigan@gmail.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @OlgaVIPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Chorama194@gmail.com>
GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>

GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <53217283+utkarsh-extc@users.noreply.github.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gnezdo+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>
Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>

Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>

Igor Bernstein <igorbernstein@google.com>
Igor Dolzhikov <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Ilya Yalovyy <yalovoy@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchiy <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>

James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>
Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnm@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Culp <jculp14@gmail.com>
Jaroslavas Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>

Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weiskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>
Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jrbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>

Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>
Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>

John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boulle <jonathanboulle@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>
Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jos Visser <josv@google.com>
Jose Luis Vzquez Gonzlez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhaug <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>

JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kelly Heller <pestophagous@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>

Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>
Keith Rarick <kr@xph.us>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitij.saraogi@gmail.com>

Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Kirylo Silin <silin@kirylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Lion Yang <lion@aosc.xyz>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>

Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>
Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>

Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>
Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>

Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdlayher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>
Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Matthieu Hauglustaine <matt.hauglustaine@gmail.com>
Matthieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdn.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>

Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszczek <mknyszczek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorf.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>
Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgraber <mteichgraber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>

Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>
Mike Wiacek <mjwiacek@google.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>

Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactapus@gmail.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>
Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>

Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>
Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogosoftware.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@daily-motion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>

Pascal S. de Kloe <pascal@quies.net>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>
Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>

Peter Dotchev <dotchev@gmail.com>
Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.borgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Pontus Leitzler <leitzler@gmail.com>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Varanasi <prashant@prashantv.com>
Pravendra Singh <hackpravj@gmail.com>
Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>

Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quinn Slack <sq@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>
Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saarelm <rsaarelm@gmail.com>
Rob Earhart <earhart@google.com>

Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Rodolfo Carvalho <rhcarvalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Verma <rohanverma2004@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>
Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <rui@google.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrd@b@gmail.com>
Ryan Canty <jrcanty@gmail.com>

Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Sakeven Jiang <jc5930@sina.cn>
Salmn Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>
Samuele Pedroni <pedronis@lucediarua.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbox@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>

Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'SnakE' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>
Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shaozhen Ding <dsz0111@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <selliot@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zs950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>

Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Spencer Nelson <s@spenczar.com>
Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littlebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlz.space>

Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>
Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattrra <taj.khattrra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <goopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>

Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>
Thomas Meson <zllak@hycik.org>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubei@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>
Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Tormod Erevik Lea <tormodlea@gmail.com>

Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <oohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>
Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>

Visweswara R <r.visweswara@gmail.com>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgrriffel@gmail.com>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>
Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xing Xing <mikespook@gmail.com>

Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherv@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>
Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbintliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>

Zev Goldstein <zev.goldstein@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
<a.maksadbek@gmail.com>
<max.faceless.frei@gmail.com>
<hagen1778@gmail.com>
<tbunyk@gmail.com>
<faxriddinjon@gmail.com>
<zs349596@gmail.com>
<bronze1man@gmail.com>

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1.282 kubernetes-api 1.8.11

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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Bits of Go-lang's `once.Do()` were cribbed and reused here, too.

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1.283 flyway-core 6.4.4

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/META-INF/maven/org.flywaydb/flyway-core/pom.xml

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jar/org/flywaydb/core/internal/database/redshift/RedshiftConnection.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/logging/android/AndroidLogCreator.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/h2/H2Schema.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/scanner/classpath/JarFileClassPathLocationScanner.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

jar/org/flywaydb/core/internal/parser/PeekingReader.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/scanner/ResourceNameCache.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/command/DbClean.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/firebird/package-info.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/api/MigrationInfoService.java
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jar/org/flywaydb/core/internal/database/snowflake/SnowflakeSchema.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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jar/org/flywaydb/core/internal/scanner/classpath/jboss/JBossVFSv2UrlResolver.java
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/api/ErrorCode.java
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/scanner/classpath/jboss/JBossVFSv3ClassPathLocationScanner.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/org/flywaydb/core/package-
info.java
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-

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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/snowflake/SnowflakeTable.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/api/callback/Warning.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/org/flywaydb/core/Flyway.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/sqlserver/SQLServerSchema.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/logging/javautil/package-info.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/resolver/ChecksumCalculator.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationExecutor.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/callback/NoopCallback.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/util/BomStrippingReader.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/callback/package-info.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/resolver/java/ResolvedJavaMigration.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/output/ErrorOutput.java
* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/clazz/NoopClassProvider.java
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/DriverDataSource.java
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* /opt/cola/permits/1100808595_1602883955.19/0/flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/package-info.java

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1.284 coturn 4.5.1.3

1.284.1 Notifications :

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>)

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1.285 sqlite 3.7.14.1

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1.286 boost 1.71.0-6ubuntu6

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Aleksey Gurtovoy (agurtovoy@meta-comm.com)

Andrei Alexandrescu (andrewalex - at - hotmail.com) (See Boost list message of August 12, 2004 11:06:58 AM EST)

Andrew Lumsdaine ()

Anthony Williams (anthony -at- justsoftwaresolutions.co.uk)

Beman Dawes (bdawes@acm.org)

Brad King (brad.king -at- kitware.com) (See Boost list message of Wed, 21 Jul 2004 11:15:46 -0400)

Brian Osman (osman -at- vvisions.com) (See CVS log)

Bruce Barr (schmoost -at- yahoo.com) (See Boost list of Mon, 16 Aug 2004 15:06:43 -0500)

Bruno da Silva de Oliveira (bruno - at - esss.com.br)

Christain Engstrom (christian.engstrom -at- glindra.org) (See Boost list message of Mon, 30 Aug 2004 14:31:49 +0200)

Cromwell D Enage (sponage -at- yahoo.com) (See Boost list message of August 12, 2004 11:49:13 AM EST)

Dan Gohman (djg -at- cray.com) (See Boost list message of Sat, 21 Aug 2004 10:54:59 +0100)

Dan Nuffer (dan -at- nuffer.name)

Daniel Frey (d.frey -at- gmx.de, daniel.frey -at- aixigo.de)

Daniel Nuffer (dan -at- nuffer.name)

Darin Adler (darin -at- bentspoon.com) (Email to Andreas Huber, see change log)

Daryle Walker (darylew - at - hotmail.com)

Dave Abrahams (dave@boost-consulting.com)

Dave Moore (dmoore -at- viefinancial.com) (See Boost list message of 18 Dec 2003 15:35:50 -0500)

David Abrahams (dave@boost-consulting.com)

Dietmar Kuehl (dietmar_kuehl -at- yahoo.com) (Email to Andreas Huber, see change log)

Douglas Gregor (gregod -at- cs.rpi.edu, dgregor -at- cs.indiana.edu, doug.gregor -at- gmail.com)

Dr John Maddock (john - at - johnmaddock.co.uk)

Edward D. Brey (brey -at- ductape.net) (Email to Andreas Huber, see change log)

Eric Ford (un5o6n902 -at- sneakemail.com) (See Boost list message of Sun, 15 Aug 2004 10:29:13 +0100)

Eric Friedman (ebf@users.sourceforge.net)

Eric Niebler (eric@boost-consulting.com)

Fernando Cacciola (fernando_cacciola@ciudad.com.ar)

Fernando Luis Cacciola Carballal (fernando_cacciola@ciudad.com.ar)

Francois Faure (Francois.Faure -at- imag.fr) (See CVS log)

Gary Powell (powellg - at - amazon.com) (See Boost list message of 10 Feb 2004 14:22:46 -0800)

Gennadiy Rozental (rogeeff -at- mail.com) (Email to Andreas Huber, see change log)

Gottfried Ganssaue (Gottfried.Ganssaue -at- HAUFE.DE) (See Boost List message of Mon, 16 Aug 2004 10:09:19 +0200)

Gottfried Ganaue (Gottfried.Ganssaue -at- HAUFE.DE) (Alternative spelling of Gottfried Ganssaue)

Greg Colvin (gregory.colvin -at- oracle.com) (See Boost list message of Sat, 14 Aug 2004 10:57:00 +0100)

Gregory Colvin (gregory.colvin -at- oracle.com) (See Boost list message of Sat, 14 Aug 2004 10:57:00 +0100)

Gunter Winkler (gunter.winkler -at- unibw-muenchen.de) (See Boost List message of Mon, 16 Aug 2004 10:24:17 +0200)

Hartmut Kaiser (hartmut.kaiser -at- gmail.com)

Herve Bronnimann (hbr -at- poly.edu)

Herv Brnnimann (hbr -at- poly.edu)

Housemarque Oy (Ilari Kuittinen ilari.kuittinen -at- housemarque.fi)

Howard Hinnant (hinnant -at- twcnv.rr.com) (See Boost list message of July 25, 2004 3:44:49 PM EST)

Hubert Holin (hubert_holin -at- users.sourceforge.net)

Indiana University ()

Itay Maman (imaman -at- users.sourceforge.net)

Jaakko Jrv (jajarvi -at- osl.iu.edu)

Jaap Suter (j.suter -at- student.utwente.nl) (See Boost list message of Thu, 16 Sep 2004 09:32:43 -0700)

Jeff Garland (jeff - at - crystalclearsoftware.com) (see Boost list post of July 25, 2004 19:31:09 -0700)

Jens Maurer (Jens.Maurer@gmx.net)

Jeremy G Siek (jsiek@osl.iu.edu)

Jeremy Siek (jsiek@osl.iu.edu)
Joel de Guzman (joel -at- boost-consulting.com) (See Boost list message of July 25, 2004 8:32:00 PM EST)
John Bandela (jbandela-at-ufl.edu)
John Maddock (john - at - johnmaddock.co.uk)
John R Bandela (jbandela-at-ufl.edu)
Jonathan Turkanis (turkanis -at- coderage dot com)
Juergen Hunold (hunold -at- ive.uni-hannover.de) (See Boost List Message of Fri, 13 Aug 2004 19:39:55 +0200)
Kevlin Henney (kevin -at- curbralan.com) (See Boost list message of Wed, 15 Sep 2004 18:15:17 +0200)
Kresimir Fresl (fresl -at- master.grad.hr) (See Boost List message of August 16, 2004 8:23:35 AM EST)
Lars Gullik Bjnnes (larsbj -at- lyx.org) (See Boost list message of Tue, 17 Aug 2004 15:49:02 +0100)
Lie-Quan Lee (liequan - at - slac.stanford.edu, llee - at - cs.indiana.edu)
Maarten Keijzer (mkeijzer -at- cs.vu.nl) (See Boost list message of Wed, 18 Aug 2004 21:43:18 +0100)
Mac Murrett (mmurrett -at- mac.com)
Marc Wintermantel (wintermantel -at- imes.mavt.ethz.ch, wintermantel -at- even-ag.ch) (See CVS log)
Michael Glassford (glassfordm - at - hotmail.com)
Michael Stevens (Michael.Stevens - at - epost.de)
Multi Media Ltd. (pdimov@mmltd.net)
Nicolai M Josuttis (solutions -at- josuttis.com) (See Boost list message of Mon, 30 Aug 2004 10:52:00 +0100)
Nikolay Mladenov (nickm -at- sitius.com) (See Boost list message of Tue, 17 Aug 2004 15:45:33 +0100)
Paul Mensonides (pmenso57 -at- comcast.net) (See Boost list message of July 21, 2004 1:12:21 AM EST)
Pavol Droba (droba -at- topmail.sk)
Peter Dimov (pdimov@mmltd.net)
R W Grosse-Kunsteleve (RWGrosse-Kunsteleve@lbl.gov)
Ralf W. Grosse-Kunsteleve (RWGrosse-Kunsteleve@lbl.gov)
Rational Discovery LLC (Greg Landrum Landrum -at- RationalDiscovery.com) (See Boost list post of Tue, 17 Aug 2004 10:35:36 +0100)
Rene Rivera (grafik/redshift-software.com, rrivera/acm.org)
Robert Ramey (ramey@www.rrsd.com)
Roland Richter (roland -at- flll.jku.at) (See Boost list post of Mon, 16 Aug 2004 22:16:55 +0200)
Roland Schwarz (roland.schwarz -at- chello.at)
Ronald Garcia (garcia -at- cs.indiana.edu) (Email to Andreas Huber, see change log)
Samuel Krempp (krempp -at- crans.ens-cachan.fr) (See Boost list message of Mon, 27 Sep 2004 13:18:36 +0200)
Stefan Seefeld (seefeld -at- sympatico.ca)
Stephen Cleary (sccleary -at- jerviswebb.com) (See Boost list message of Tue, 28 Sep 2004 13:11:46 +0100)
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Mathias Koch (mkoch - at - idesis.de 7 : email to boost-owner@lists.boost.org Sep 2007 13:20:09 +0200)

--- end ---

1.287 libgpg-error 1.37 1

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```
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/client/ResourceAccessException.java
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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/bind/annotation/InitBinder.java

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/HttpEntity.java
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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/filter/ForwardedHeaderFilter.java

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/codec/protobuf/ProtobufHttpMessageWriter.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/HttpHandler.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/util/pattern/SeparatorPathElement.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/ServerHttpResponseDecorator.java

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/web/accept/AbstractMappingContentNegotiationStrategy.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/remoting/caucho/SimpleHessianServiceExporter.java

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jar/org/springframework/web/HttpMediaTypeException.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
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jar/org/springframework/web/context/annotation/RequestScope.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/bind/annotation/ModelAttribute.java
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```

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# Although created for httpd, this file is used by many software systems
# and has been placed in the public domain for unlimited redistribution.
#
# The table below contains both registered and (common) unregistered types.
# A type that has no unique extension can be ignored -- they are listed
# here to guide configurations toward known types and to make it easier to
# identify "new" types. File extensions are also commonly used to indicate
# content languages and encodings, so choose them carefully.
#
# Internet media types should be registered as described in RFC 4288.
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#
# This file was retrieved from
https://svn.apache.org/viewvc/httpd/httpd/trunk/docs/conf/mime.types?revision=1752884&view=co
#
# MIME type (lowercased) Extensions
# =====
# application/1d-interleaved-parityfec
# application/3gpdash-qoe-report+xml

```

application/3gpp-ims+xml
application/a2l
application/activemessage
application/alto-costmap+json
application/alto-costmapfilter+json
application/alto-directory+json
application/alto-endpointcost+json
application/alto-endpointcostparams+json
application/alto-endpointprop+json
application/alto-endpointpropparams+json
application/alto-error+json
application/alto-networkmap+json
application/alto-networkmapfilter+json
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application/cdmi-object cdmio
application/cdmi-queue cdmiq
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application/cellml+xml
application/cfw
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application/emergencycalldata.serviceinfo+xml
application/emergencycalldata.subscriberinfo+xml
application/emma+xml emma
application/emotionml+xml
application/encaprtp
application/epp+xml
application/epub+zip epub
application/eshop
application/example
application/exi exi
application/fastinfoset
application/fastsoap
application/fdt+xml

application/fits
application/font-sfnt
application/font-tdpfr pfr
application/font-woff woff
application/framework-attributes+xml
application/geo+json
application/gml+xml gml
application/gpx+xml gpx
application/gxf gxf
application/gzip
application/h224
application/held+xml
application/http
application/hyperstudio stk
application/ibe-key-request+xml
application/ibe-pkg-reply+xml
application/ibe-pp-data
application/iges
application/im-iscomposing+xml
application/index
application/index.cmd
application/index.obj
application/index.response
application/index.vnd
application/inkml+xml ink inkml
application/iotp
application/ipfix ipfix
application/ipp
application/isup
application/its+xml
application/java-archive jar
application/java-serialized-object ser
application/java-vm class
application/javascript js
application/jose
application/jose+json
application/jrd+json
application/json json
application/json-patch+json
application/json-seq
application/jsonml+json jsonml
application/jwk+json
application/jwk-set+json
application/jwt
application/kpml-request+xml
application/kpml-response+xml
application/ld+json
application/lgr+xml

application/link-format
application/load-control+xml
application/lost+xml lostxml
application/lostsync+xml
application/lxf
application/mac-binhex40 hqx
application/mac-compactpro cpt
application/macwriteii
application/mads+xml mads
application/marc mrc
application/marcxml+xml mrcx
application/mathematica ma nb mb
application/mathml+xml mathml
application/mathml-content+xml
application/mathml-presentation+xml
application/mbms-associated-procedure-description+xml
application/mbms-deregister+xml
application/mbms-envelope+xml
application/mbms-msk+xml
application/mbms-msk-response+xml
application/mbms-protection-description+xml
application/mbms-reception-report+xml
application/mbms-register+xml
application/mbms-register-response+xml
application/mbms-schedule+xml
application/mbms-user-service-description+xml
application/mbox mbox
application/media-policy-dataset+xml
application/media_control+xml
application/mediaservercontrol+xml mscml
application/merge-patch+json
application/metalink+xml metalink
application/metalink4+xml meta4
application/mets+xml mets
application/mf4
application/mikey
application/mods+xml mods
application/moss-keys
application/moss-signature
application/mosskey-data
application/mosskey-request
application/mp21 m21 mp21
application/mp4 mp4s
application/mpeg4-generic
application/mpeg4-iod
application/mpeg4-iod-xmt
application/mrb-consumer+xml
application/mrb-publish+xml

```
# application/msc-ivr+xml
# application/msc-mixer+xml
application/msword doc dot
application/mxf mxf
# application/nasdata
# application/news-checkgroups
# application/news-groupinfo
# application/news-transmission
# application/nlsml+xml
# application/nss
# application/ocsp-request
# application/ocsp-response
application/octet-stream bin dms lrf mar so dist distz pkg bpk dump elc deploy
application/oda oda
# application/odx
application/obeps-package+xml opf
application/ogg ogg
application/omdoc+xml omdoc
application/onenote onetoc onetoc2 onetmp onepkg
application/oxps oxps
# application/p2p-overlay+xml
# application/parityfec
application/patch-ops-error+xml xer
application/pdf pdf
# application/pdx
application/pgp-encrypted pgp
# application/pgp-keys
application/pgp-signature asc sig
application/pics-rules prf
# application/pidf+xml
# application/pidf-diff+xml
application/pkcs10 p10
# application/pkcs12
application/pkcs7-mime p7m p7c
application/pkcs7-signature p7s
application/pkcs8 p8
application/pkix-attr-cert ac
application/pkix-cert cer
application/pkix-crl crl
application/pkix-pkipath pkipath
application/pkixcmp pki
application/pls+xml pls
# application/poc-settings+xml
application/postscript ai eps ps
# application/ppsp-tracker+json
# application/problem+json
# application/problem+xml
# application/provenance+xml
```


application/prs.alvestrand.titrax-sheet
application/prs.cww cww
application/prs.hpub+zip
application/prs.nprend
application/prs.plucker
application/prs.rdf+xml-crypt
application/prs.xsf+xml
application/pskc+xml pskcxml
application/qsig
application/raptorfec
application/rdap+json
application/rdf+xml rdf
application/reginfo+xml rif
application/relax-ng-compact-syntax rnc
application/remote-printing
application/reputon+json
application/resource-lists+xml rl
application/resource-lists-diff+xml rld
application/rfc+xml
application/riscos
application/rlmi+xml
application/rls-services+xml rs
application/rpki-ghostbusters gbr
application/rpki-manifest mft
application/rpki-roa roa
application/rpki-updown
application/rsd+xml rsd
application/rss+xml rss
application/rtf rtf
application/rtploopback
application/rtx
application/samlassertion+xml
application/samlmetadata+xml
application/sbml+xml sbml
application/scaip+xml
application/scim+json
application/scvp-cv-request scq
application/scvp-cv-response scs
application/scvp-vp-request spq
application/scvp-vp-response spp
application/sdp sdp
application/sep+xml
application/sep-exi
application/session-info
application/set-payment
application/set-payment-initiation setpay
application/set-registration
application/set-registration-initiation setreg

application/sgml
application/sgml-open-catalog
application/shf+xml shf
application/sieve
application/simple-filter+xml
application/simple-message-summary
application/simplesymbolcontainer
application/slate
application/smil
application/smil+xml smi smil
application/smpite336m
application/soap+fastinfoset
application/soap+xml
application/sparql-query rq
application/sparql-results+xml srx
application/spirits-event+xml
application/sql
application/srgs gram
application/srgs+xml grxml
application/sru+xml sru
application/ssdl+xml ssdl
application/ssml+xml ssml
application/tamp-apex-update
application/tamp-apex-update-confirm
application/tamp-community-update
application/tamp-community-update-confirm
application/tamp-error
application/tamp-sequence-adjust
application/tamp-sequence-adjust-confirm
application/tamp-status-query
application/tamp-status-response
application/tamp-update
application/tamp-update-confirm
application/tei+xml tei teicorpus
application/thraud+xml tfi
application/timestamp-query
application/timestamp-reply
application/timestamped-data tsd
application/ttml+xml
application/tve-trigger
application/ulpfec
application/urc-grpsheet+xml
application/urc-ressheet+xml
application/urc-targetdesc+xml
application/urc-uisocketdesc+xml
application/vcard+json
application/vcard+xml
application/vemmi

application/vividence.scriptfile
application/vnd.3gpp-prose+xml
application/vnd.3gpp-prose-pc3ch+xml
application/vnd.3gpp.access-transfer-events+xml
application/vnd.3gpp.bsf+xml
application/vnd.3gpp.mid-call+xml
application/vnd.3gpp.pic-bw-large plb
application/vnd.3gpp.pic-bw-small psb
application/vnd.3gpp.pic-bw-var pvb
application/vnd.3gpp.sms
application/vnd.3gpp.sms+xml
application/vnd.3gpp.srvcc-ext+xml
application/vnd.3gpp.srvcc-info+xml
application/vnd.3gpp.state-and-event-info+xml
application/vnd.3gpp.ussd+xml
application/vnd.3gpp2.bcmsginfo+xml
application/vnd.3gpp2.sms
application/vnd.3gpp2.tcap tcap
application/vnd.3lightssoftware.imagescal
application/vnd.3m.post-it-notes pwn
application/vnd.accpac.simply.aso aso
application/vnd.accpac.simply.imp imp
application/vnd.acucobol acu
application/vnd.acucorp atc acutc
application/vnd.adobe.air-application-installer-package+zip air
application/vnd.adobe.flash.movie
application/vnd.adobe.formscentral.fcdt fcdt
application/vnd.adobe.fxp fxp fxpl
application/vnd.adobe.partial-upload
application/vnd.adobe.xdp+xml xdp
application/vnd.adobe.xfdf xfdf
application/vnd.aether.imp
application/vnd.ah-barcode
application/vnd.ahead.space ahead
application/vnd.airzip.filesecure.azf azf
application/vnd.airzip.filesecure.azs azs
application/vnd.amazon.ebook azw
application/vnd.amazon.mobi8-ebook
application/vnd.americandynamics.acc acc
application/vnd.amiga.ami ami
application/vnd.amundsen.maze+xml
application/vnd.android.package-archive apk
application/vnd.anki
application/vnd.anser-web-certificate-issue-initiation cii
application/vnd.anser-web-funds-transfer-initiation fti
application/vnd.antix.game-component atx
application/vnd.apache.thrift.binary
application/vnd.apache.thrift.compact

```
# application/vnd.apache.thrift.json
# application/vnd.api+json
application/vnd.apple.installer+xml mpkg
application/vnd.apple.mpegurl m3u8
# application/vnd.arastra.swi
application/vnd.aristanetworks.swi swi
# application/vnd.artsquare
application/vnd.astraea-software.iota iota
application/vnd.audiograph aep
# application/vnd.autopackage
# application/vnd.avistar+xml
# application/vnd.balsamiq.bmml+xml
# application/vnd.balsamiq.bmpr
# application/vnd.bekitzur-stech+json
# application/vnd.biopax.rdf+xml
application/vnd.blueice.multipass mpm
# application/vnd.bluetooth.ep.oob
# application/vnd.bluetooth.le.oob
application/vnd.bmi bmi
application/vnd.businessobjects rep
# application/vnd.cab-jscript
# application/vnd.canon-cpdl
# application/vnd.canon-lips
# application/vnd.cendio.thinlinc.clientconf
# application/vnd.century-systems.tcp_stream
application/vnd.chemdraw+xml cdxml
# application/vnd.chess-pgn
application/vnd.chipnuts.karaoke-mmd mmd
application/vnd.cinderella cdy
# application/vnd.cirpack.isdn-ext
# application/vnd.citationstyles.style+xml
application/vnd.claymore cla
application/vnd.cloanto.rp9 rp9
application/vnd.clonk.c4group c4g c4d c4f c4p c4u
application/vnd.cluetrust.cartomobile-config c11amc
application/vnd.cluetrust.cartomobile-config-pkg c11amz
# application/vnd.coffeescript
# application/vnd.collection+json
# application/vnd.collection.doc+json
# application/vnd.collection.next+json
# application/vnd.comicbook+zip
# application/vnd.commerce-battelle
application/vnd.commonspace csp
application/vnd.contact.cmsg cdbcmg
# application/vnd.coreos.ignition+json
application/vnd.cosmocaller cmc
application/vnd.crick.clicker clkx
application/vnd.crick.clicker.keyboard clkk
```

application/vnd.crick.clicker.palette clkp
application/vnd.crick.clicker.template clkt
application/vnd.crick.clicker.wordbank clkw
application/vnd.criticaltools.wbs+xml wbs
application/vnd.ctc-posml pml
application/vnd.ctct.ws+xml
application/vnd.cups-pdf
application/vnd.cups-postscript
application/vnd.cups-ppd ppd
application/vnd.cups-raster
application/vnd.cups-raw
application/vnd.curl
application/vnd.curl.car car
application/vnd.curl.pcurl pcurl
application/vnd.cyan.dean.root+xml
application/vnd.cybank
application/vnd.dart dart
application/vnd.data-vision.rdz rdz
application/vnd.debian.binary-package
application/vnd.dece.data uvf uvvf uvd uvvd
application/vnd.dece.ttml+xml uvt uvvt
application/vnd.dece.unsigned uvx uvvx
application/vnd.dece.zip uvz uvvz
application/vnd.denovo.fcselayout-link fe_launch
application/vnd.desmume.movie
application/vnd.dir-bi.plate-dl-nosuffix
application/vnd.dm.delegation+xml
application/vnd.dna dna
application/vnd.document+json
application/vnd.dolby.mlp mlp
application/vnd.dolby.mobile.1
application/vnd.dolby.mobile.2
application/vnd.doremir.scorecloud-binary-document
application/vnd.dpgraph dpg
application/vnd.dreamfactory dfac
application/vnd.drive+json
application/vnd.ds-keypoint kpxx
application/vnd.dtg.local
application/vnd.dtg.local.flash
application/vnd.dtg.local.html
application/vnd.dvb.ait ait
application/vnd.dvb.dvbj
application/vnd.dvb.esgcontainer
application/vnd.dvb.ipdcdftnotifaccess
application/vnd.dvb.ipdcesgaccess
application/vnd.dvb.ipdcesgaccess2
application/vnd.dvb.ipdcesgpdd
application/vnd.dvb.ipdcroaming

application/vnd.dvb.iptv.alfec-base
application/vnd.dvb.iptv.alfec-enhancement
application/vnd.dvb.notif-aggregate-root+xml
application/vnd.dvb.notif-container+xml
application/vnd.dvb.notif-generic+xml
application/vnd.dvb.notif-ia-msglist+xml
application/vnd.dvb.notif-ia-registration-request+xml
application/vnd.dvb.notif-ia-registration-response+xml
application/vnd.dvb.notif-init+xml
application/vnd.dvb.pfr
application/vnd.dvb.service svc
application/vnd.dxr
application/vnd.dynageo geo
application/vnd.dzr
application/vnd.easykaraoke.cdgdownload
application/vnd.ecdis-update
application/vnd.ecowin.chart mag
application/vnd.ecowin.filerequest
application/vnd.ecowin.fileupdate
application/vnd.ecowin.series
application/vnd.ecowin.seriesrequest
application/vnd.ecowin.seriesupdate
application/vnd.emclient.accessrequest+xml
application/vnd.enliven nml
application/vnd.enphase.envoy
application/vnd.eprints.data+xml
application/vnd.epson.esf esf
application/vnd.epson.msf msf
application/vnd.epson.quickanime qam
application/vnd.epson.salt slt
application/vnd.epson.ssf ssf
application/vnd.ericsson.quickcall
application/vnd.eszigno3+xml es3 et3
application/vnd.etsi.aoc+xml
application/vnd.etsi.asic-e+zip
application/vnd.etsi.asic-s+zip
application/vnd.etsi.cug+xml
application/vnd.etsi.iptvcommand+xml
application/vnd.etsi.iptvdiscovery+xml
application/vnd.etsi.iptvprofile+xml
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application/vnd.etsi.iptvueprofile+xml
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application/vnd.etsi.overload-control-policy-dataset+xml
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application/vnd.etsi.tsl+xml
application/vnd.etsi.tsl.der
application/vnd.eudora.data
application/vnd.ezpix-album ez2
application/vnd.ezpix-package ez3
application/vnd.f-secure.mobile
application/vnd.fastcopy-disk-image
application/vnd.fdf fdf
application/vnd.fdsn.mseed mseed
application/vnd.fdsn.seed seed dataless
application/vnd.ffsns
application/vnd.filmit.zfc
application/vnd.fints
application/vnd.firemonkeys.cloudcell
application/vnd.flographit gph
application/vnd.fluxtime.clip ftc
application/vnd.font-fontforge-sfd
application/vnd.frameMaker fm frame maker book
application/vnd.frogans.fnc fnc
application/vnd.frogans.ltf ltf
application/vnd.fsc.weblaunch fsc
application/vnd.fujitsu.oasys oas
application/vnd.fujitsu.oasys2 oa2
application/vnd.fujitsu.oasys3 oa3
application/vnd.fujitsu.oasysgp fg5
application/vnd.fujitsu.oasysprs bh2
application/vnd.fujixerox.art-ex
application/vnd.fujixerox.art4
application/vnd.fujixerox.ddd ddd
application/vnd.fujixerox.docuworks xdw
application/vnd.fujixerox.docuworks.binder xbd
application/vnd.fujixerox.docuworks.container
application/vnd.fujixerox.hbpl
application/vnd.fut-misnet
application/vnd.fuzzysheet fzs
application/vnd.genomatix.tuxedo txd
application/vnd.geo+json
application/vnd.geocube+xml
application/vnd.geogebra.file ggb
application/vnd.geogebra.tool ggt
application/vnd.geometry-explorer gex gre
application/vnd.geonext gxt
application/vnd.geoplan g2w

application/vnd.geospace g3w
application/vnd.gerber
application/vnd.globalplatform.card-content-mgt
application/vnd.globalplatform.card-content-mgt-response
application/vnd.gmx gmx
application/vnd.google-earth.kml+xml kml
application/vnd.google-earth.kmz kmz
application/vnd.gov.sk.e-form+xml
application/vnd.gov.sk.e-form+zip
application/vnd.gov.sk.xmldatacontainer+xml
application/vnd.grafeq gqf gqs
application/vnd.gridmp
application/vnd.groove-account gac
application/vnd.groove-help ghf
application/vnd.groove-identity-message gim
application/vnd.groove-injector grv
application/vnd.groove-tool-message gtm
application/vnd.groove-tool-template tpl
application/vnd.groove-vcard vcg
application/vnd.hal+json
application/vnd.hal+xml hal
application/vnd.handheld-entertainment+xml zmm
application/vnd.hbci hbci
application/vnd.hcl-bireports
application/vnd.hdt
application/vnd.heroku+json
application/vnd.hhe.lesson-player les
application/vnd.hp-hpgl hpgl
application/vnd.hp-hpid hpid
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application/vnd.hp-jlyt jlt
application/vnd.hp-pcl pcl
application/vnd.hp-pclxl pclxl
application/vnd.httpphone
application/vnd.hydrostatix.sof-data sfd-hdstx
application/vnd.hyperdrive+json
application/vnd.hzn-3d-crossword
application/vnd.ibm.afplinedata
application/vnd.ibm.electronic-media
application/vnd.ibm.minipay mpy
application/vnd.ibm.modcap afp listafp list3820
application/vnd.ibm.rights-management irm
application/vnd.ibm.secure-container sc
application/vnd.iccprofile icc icm
application/vnd.ieee.1905
application/vnd.igloader igl
application/vnd.immervision-ivp ivp
application/vnd.immervision-ivu ivu

application/vnd.ims.imsccv1p1
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application/vnd.ims.imsccv1p3
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application/vnd.ims.lti.v2.toolproxy+json
application/vnd.ims.lti.v2.toolproxy.id+json
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application/vnd.ims.lti.v2.toolsettings.simple+json
application/vnd.informedcontrol.rms+xml
application/vnd.informix-visionary
application/vnd.infotech.project
application/vnd.infotech.project+xml
application/vnd.innopath.wamp.notification
application/vnd.insors.igm igm
application/vnd.intercon.formnet xpw xpx
application/vnd.intergeo i2g
application/vnd.intertrust.digibox
application/vnd.intertrust.nncp
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application/vnd.intu.qfx qfx
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application/vnd.irepository.package+xml irp
application/vnd.is-xpr xpr
application/vnd.isac.fcs fcs
application/vnd.jam jam
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application/vnd.japannet-payment-wakeup
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application/vnd.jisp jisp
application/vnd.joost.joda-archive joda
application/vnd.jsk.isdn-ngn
application/vnd.kahootz ktz ktr
application/vnd.kde.karbon karbon
application/vnd.kde.kchart chrt

application/vnd.kde.kformula kfo
application/vnd.kde.kivio flw
application/vnd.kde.kontour kon
application/vnd.kde.kpresenter kpr kpt
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application/vnd.kde.kword kwd kwt
application/vnd.kenameaapp htke
application/vnd.kidspiration kia
application/vnd.kinar kne knp
application/vnd.koan skp skd skt skm
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application/vnd.las.las+xml lasxml
application/vnd.liberty-request+xml
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application/vnd.llamagraphics.life-balance.exchange+xml lbe
application/vnd.lotus-1-2-3 123
application/vnd.lotus-approach apr
application/vnd.lotus-freelance pre
application/vnd.lotus-notes nsf
application/vnd.lotus-organizer org
application/vnd.lotus-screencam scm
application/vnd.lotus-wordpro lwp
application/vnd.macports.portpkg portpkg
application/vnd.mapbox-vector-tile
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application/vnd.marlin.drm.conftoken+xml
application/vnd.marlin.drm.license+xml
application/vnd.marlin.drm.mdcf
application/vnd.mason+json
application/vnd.maxmind.maxmind-db
application/vnd.mcd mcd
application/vnd.medcalldata mc1
application/vnd.mediastation.cdkey cdkey
application/vnd.meridian-slideshow
application/vnd.mfer mwf
application/vnd.mfmp mfm
application/vnd.micro+json
application/vnd.micrografx.flo flo
application/vnd.micrografx.igx igx
application/vnd.microsoft.portable-executable
application/vnd.miele+json
application/vnd.mif mif
application/vnd.minisoft-hp3000-save
application/vnd.mitsubishi.misty-guard.trustweb
application/vnd.mobius.daf daf
application/vnd.mobius.dis dis
application/vnd.mobius.mbk mbk
application/vnd.mobius.mqy mqy

application/vnd.mobius.msl msl
application/vnd.mobius.plc plc
application/vnd.mobius.txf txf
application/vnd.mophun.application mpn
application/vnd.mophun.certificate mpc
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application/vnd.motorola.flexsuite.adsi
application/vnd.motorola.flexsuite.fis
application/vnd.motorola.flexsuite.gotap
application/vnd.motorola.flexsuite.kmr
application/vnd.motorola.flexsuite.ttc
application/vnd.motorola.flexsuite.wem
application/vnd.motorola.iprm
application/vnd.mozilla.xul+xml xul
application/vnd.ms-3mfdocument
application/vnd.ms-artgalry cil
application/vnd.ms-asf
application/vnd.ms-cab-compressed cab
application/vnd.ms-color.iccprofile
application/vnd.ms-excel xls xlm xla xlc xlt xlw
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application/vnd.ms-excel.sheet.macroenabled.12 xlsx
application/vnd.ms-excel.template.macroenabled.12 xltm
application/vnd.ms-fontobject eot
application/vnd.ms-htmlhelp chm
application/vnd.ms-ims ims
application/vnd.ms-lrm lrm
application/vnd.ms-office.activex+xml
application/vnd.ms-officetheme thmx
application/vnd.ms-opentype
application/vnd.ms-package.obfuscated-opentype
application/vnd.ms-pki.seccat cat
application/vnd.ms-pki.stl stl
application/vnd.ms-playready.initiator+xml
application/vnd.ms-powerpoint ppt pps pot
application/vnd.ms-powerpoint.addin.macroenabled.12 ppam
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# application/vnd.wfa.wsc
# application/vnd.windows.devicepairing
# application/vnd.wmc
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application/voicexml+xml vxml
# application/vq-rtcpvr
# application/watcherinfo+xml
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application/xenc+xml xenc
application/xhtml+xml xhtml xht
application/xhtml-voice+xml
application/xml xml xsl
application/xml-dtd dtd
application/xml-external-parsed-entity
application/xml-patch+xml
application/xmpp+xml
application/xop+xml xop
application/xproc+xml xpl
application/xslt+xml xslt
application/xspf+xml xspf

application/xv+xml mxml xhvm xvm xvm
application/yang yang
application/yin+xml yin
application/zip zip
application/zlib
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audio/adpcm adp
audio/amr
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image/x-pict pic pct

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image/x-portable-graymap pgm
image/x-portable-pixmap ppm
image/x-rgb rgb
image/x-tga tga
image/x-xbitmap xbm
image/x-xpixmap xpm
image/x-xwindowdump xwd
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message/disposition-notification
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message/global
message/global-delivery-status
message/global-disposition-notification
message/global-headers
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message/imdn+xml
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message/partial
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text/rtx
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text/tab-separated-values tsv
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text/turtle ttl
text/ulpfec
text/uri-list uri uris urls
text/vcard vcard
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video/pointer
video/quicktime qt mov


```
# video/raptorfec
# video/raw
# video/rtp-enc-aescm128
# video/rtploopback
# video/rtx
# video/smppte292m
# video/ulpfec
# video/vc1
# video/vnd.cctv
video/vnd.dece.hd   uvh uvvh
video/vnd.dece.mobile  uvm uvvm
# video/vnd.dece.mp4
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# video/vnd.dlna.mpeg-tts
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# video/vnd.objectvideo
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video/vnd.vivo   viv
# video/vp8
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video/x-f4v   f4v
video/x-fli   fli
video/x-flv   flv
video/x-m4v   m4v
```

video/x-matroska mkv mk3d mks
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video/x-ms-wmx wmx
video/x-ms-wvx wvx
video/x-msvideo avi
video/x-sgi-movie movie
video/x-smv smv
x-conference/x-cooltalk ice

Found in path(s):

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/mime.types

No license file was found, but licenses were detected in source scan.

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Found in path(s):

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/ReactorServerHttpRequest.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/codec/support/BaseDefaultCodecs.java

* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-jar/org/springframework/http/server/reactive/DefaultServerHttpRequestBuilder.java

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* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/converter/protobuf/ProtobufHttpMessageConverter.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/method/support/AsyncHandlerMethodReturnValueHandler.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/codec/support/DefaultClientCodecConfigurer.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/server/handler/DefaultWebFilterChain.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/converter/xml/Jaxb2RootElementHttpMessageConverter.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/filter/AbstractRequestLoggingFilter.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/codec/cbor/Jackson2CborDecoder.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/util/UriTemplate.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/codec/xml/Jaxb2XmlEncoder.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-

jar/org/springframework/web/method/annotation/MapMethodProcessor.java

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```
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/support/ServletContextPropertySource.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/client/ClientHttpRequest.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/converter/feed/AtomFeedHttpMessageConverter.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/server/ServerHttpAsyncRequestControl.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/support/ServletConfigPropertySource.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/jsf/FacesContextUtils.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/context/ConfigurableWebApplicationContext.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/web/method/support/HandlerMethodArgumentResolver.java
* /opt/cola/permits/1135888219_1613626164.16/0/spring-web-5-2-8-release-sources-1-
jar/org/springframework/http/client/AbstractClientHttpRequest.java
```

1.289 hd-parm 9.38

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1.290 management-model 5.7.3

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/call/Parameter.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/Settings.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/cluster/ClientIdentifier.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/DelegatingStatistic.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/notification/ContextualNotification.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/message/ManagementCallMessage.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/call/ContextualCall.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/DefaultCapability.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/StatisticDescriptor.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/context/Context.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/context/ContextContainer.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/context/Contextual.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/Capability.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/call/ContextualReturn.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/message/Message.java

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/CallDescriptor.java

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/StatisticType.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/DelegatingSample.java

* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/StatisticRegistry.java

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* /opt/ws_local/PERMITS_SQL/1004299243_1595245528.96/0/management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/context/CapabilityContext.java

1.291 p11-kit 0.23.20-1ubuntu0.1

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1.292 coreutils 8.30 3ubuntu2

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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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<https://github.com/golang/protobuf>

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package engine

```
import (  
    "bytes"  
    "encoding/json"  
    "strings"  
    "testing"  
    "time"  
  
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
    "gotest.tools/assert"  
    is "gotest.tools/assert/cmp"  
)  
  
func TestSubscriptionContextWrite(t *testing.T) {  
    cases := []struct {  
        context formatter.Context  
        expected string  
    }{  
        // Errors  
        {  
            formatter.Context{Format: "{{InvalidFunction}}"},  
            `Template parsing error: template: :1: function "InvalidFunction" not defined`  
        },  
        {  
            formatter.Context{Format: "{{nil}}"},  
            `Template parsing error: template: :1:2: executing "" at <nil>: nil is not a command`  
        },  
        // Table format  
        {  
            formatter.Context{Format: NewSubscriptionsFormat("table", false)},  
            `NUM          OWNER          PRODUCT ID    EXPIRES          PRICING COMPONENTS  
1            owner1        productid1    2020-01-01 10:00:00 +0000 UTC  compstring  
2            owner2        productid2    2020-01-01 10:00:00 +0000 UTC  compstring`  
        },  
        {  
            formatter.Context{Format: NewSubscriptionsFormat("table", true)},  
            `1:License Name: name1 Quantity: 10 nodes Expiration date: 2020-01-01  
2:License Name: name2 Quantity: 20 nodes Expiration date: 2020-01-01`  
        }  
    }  
}
```

```

`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", false)},
  `OWNER
owner1
owner2
`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("table {{.Owner}}", true)},
  `OWNER
owner1
owner2
`,
},
// Raw Format
{
  formatter.Context{Format: NewSubscriptionsFormat("raw", false)},
  `license: id1
name: name1
owner: owner1
components: compstring

license: id2
name: name2
owner: owner2
components: compstring
`,
},
{
  formatter.Context{Format: NewSubscriptionsFormat("raw", true)},
  `license: id1
license: id2
`,
},
// Custom Format
{
  formatter.Context{Format: NewSubscriptionsFormat("{{.Owner}}", false)},
  `owner1
owner2
`,
},
}

expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")

```

```

for _, testcase := range cases {
subscriptions := []licenseutils.LicenseDisplay{
{
Num: 1,
Owner: "owner1",
Subscription: model.Subscription{
ID: "id1",
Name: "name1",
ProductID: "productid1",
Expires: &expiration,
PricingComponents: model.PricingComponents{
&model.SubscriptionPricingComponent{
Name: "nodes",
Value: 10,
},
},
},
ComponentsString: "compstring",
},
{
Num: 2,
Owner: "owner2",
Subscription: model.Subscription{
ID: "id2",
Name: "name2",
ProductID: "productid2",
Expires: &expiration,
PricingComponents: model.PricingComponents{
&model.SubscriptionPricingComponent{
Name: "nodes",
Value: 20,
},
},
},
ComponentsString: "compstring",
},
}
out := &bytes.Buffer{}
testcase.context.Output = out
err := SubscriptionsWrite(testcase.context, subscriptions)
if err != nil {
assert.Error(t, err, testcase.expected)
} else {
assert.Check(t, is.Equal(testcase.expected, out.String()))
}
}
}

```

```

func TestSubscriptionContextWriteJSON(t *testing.T) {
    expiration, _ := time.Parse(time.RFC822, "01 Jan 20 10:00 UTC")
    subscriptions := []licenseutils.LicenseDisplay{
        {
            Num: 1,
            Owner: "owner1",
            Subscription: model.Subscription{
                ID: "id1",
                Name: "name1",
                ProductID: "productid1",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 10,
                    },
                },
            },
            ComponentsString: "compstring",
        },
        {
            Num: 2,
            Owner: "owner2",
            Subscription: model.Subscription{
                ID: "id2",
                Name: "name2",
                ProductID: "productid2",
                Expires: &expiration,
                PricingComponents: model.PricingComponents{
                    &model.SubscriptionPricingComponent{
                        Name: "nodes",
                        Value: 20,
                    },
                },
            },
            ComponentsString: "compstring",
        },
    }
    expectedJSONs := []map[string]interface{}{
        {
            "Owner": "owner1",
            "ComponentsString": "compstring",
            "Expires": "2020-01-01T10:00:00Z",
            "DockerID": "",
            "Eusa": nil,
            "ID": "id1",
            "Start": nil,
            "Name": "name1",
        },
    }
}

```

```

"Num":      float64(1),
"PricingComponents": []interface{}{
  map[string]interface{}{
    "name": "nodes",
    "value": float64(10),
  },
},
"ProductID":      "productid1",
"ProductRatePlan": "",
"ProductRatePlanID": "",
"State":      "",
"Summary":      "License Name: name1\tQuantity: 10 nodes\tExpiration date: 2020-01-01",
},
{
  "Owner":      "owner2",
  "ComponentsString": "compstring",
  "Expires":      "2020-01-01T10:00:00Z",
  "DockerID":      "",
  "Eusa":      nil,
  "ID":      "id2",
  "Start":      nil,
  "Name":      "name2",
  "Num":      float64(2),
  "PricingComponents": []interface{}{
    map[string]interface{}{
      "name": "nodes",
      "value": float64(20),
    },
  },
},
"ProductID":      "productid2",
"ProductRatePlan": "",
"ProductRatePlanID": "",
"State":      "",
"Summary":      "License Name: name2\tQuantity: 20 nodes\tExpiration date: 2020-01-01",
},
}

```

```

out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .}}", Output: out}, subscriptions)
if err != nil {
  t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
  var m map[string]interface{}
  if err := json.Unmarshal([]byte(line), &m); err != nil {
    t.Fatal(err)
  }
  assert.Check(t, is.DeepEqual(expectedJSONs[i], m))
}

```

```

}
}

func TestSubscriptionContextWriteJSONField(t *testing.T) {
subscriptions := []licenseutils.LicenseDisplay{
{Num: 1, Owner: "owner1"},
{Num: 2, Owner: "owner2"},
}
out := &bytes.Buffer{ }
err := SubscriptionsWrite(formatter.Context{Format: "{{json .Owner}}", Output: out}, subscriptions)
if err != nil {
t.Fatal(err)
}
for i, line := range strings.Split(strings.TrimSpace(out.String()), "\n") {
var s string
if err := json.Unmarshal([]byte(line), &s); err != nil {
t.Fatal(err)
}
assert.Check(t, is.Equal(subscriptions[i].Owner, s))
}
}
}

```

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Data model artifacts for Prometheus.

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package licensing

```
import (  
  "context"  
  "crypto/hmac"  
  "crypto/sha256"  
  "encoding/base64"
```

```

"encoding/json"
"fmt"
"time"

"github.com/docker/libtrust"
"github.com/docker/licensing/lib/errors"
"github.com/docker/licensing/lib/go-clientlib"
"github.com/docker/licensing/model"
)

func (c *client) getLicenseFile(ctx context.Context, subID string) (*model.IssuedLicense, error) {
    url := c.baseURI
    url.Path += fmt.Sprintf("/api/billing/v4/subscriptions/%s/license-file", subID)

    license := new(model.IssuedLicense)
    if _, _, err := c.doReq(ctx, "GET", &url, clientlib.RecvJSON(license)); err != nil {
        return nil, err
    }

    return license, nil
}

// Check verifies that the license identified by the given key id is valid. Note that it does not
// interrogate the contents of the license.
func (c *client) check(ctx context.Context, license model.IssuedLicense) (*model.CheckResponse, error) {
    keyID := license.KeyID
    privateKey := license.PrivateKey

    authorization, err := c.getAuthorization(ctx, license)
    if err != nil {
        return nil, err
    }

    // TODO: Mason - replace this parseJWS with a non libtrust lib
    signature, err := libtrust.ParseJWS(authorization)
    if err != nil {
        return nil, errors.Wrapf(err, errors.Fields{
            "key_id": keyID,
        }, "license parse JWS failed")
    }

    keys, err := signature.Verify()
    if err != nil {
        return nil, errors.Wrapf(err, errors.Fields{
            "key_id": keyID,
        }, "license signature verification failed")
    }
}

```

```

keyCnt := len(keys)
if keyCnt != 1 {
    err = fmt.Errorf("unexpected number of signing keys (%d)", keyCnt)
    return nil, errors.WithStack(err).With(errors.Fields{
        "key_id": keyID,
    })
}

key := keys[0]

if !c.recognizedSigningKey(key) {
    return nil, errors.New("unrecognized signing key")
}

payload, err := signature.Payload()
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "malformed signature payload")
}

checkRes := new(model.CheckResponse)

err = json.Unmarshal(payload, &checkRes)
if err != nil {
    return nil, errors.Wrapf(err, errors.Fields{
        "key_id": keyID,
    }, "license payload unmarshal failed")
}

msg := checkRes.Expiration.Format(time.RFC3339)
if err := checkToken(msg, checkRes.Token, privateKey); err != nil {
    return nil, errors.Wrap(err, errors.Fields{
        "key_id": keyID,
    })
}

return checkRes, nil
}

// recognizedSigningKey returns true if the given key is signed with a recognized signing key, false otherwise
func (c *client) recognizedSigningKey(key libtrust.PublicKey) bool {
    for _, publicKey := range c.publicKeys {
        if key.KeyID() == publicKey.KeyID() {
            return true
        }
    }
    return false
}

```

```

}

// getAuthorization returns the decoded license authorization
func (c *client) getAuthorization(ctx context.Context, license model.IssuedLicense) ([]byte, error) {
    decoded, err := base64.StdEncoding.DecodeString(license.Authorization)
    if err != nil {
        return nil, errors.Wrapf(err, errors.Fields{
            "key_id": license.KeyID,
        }, "decoding license authorization failed")
    }
    return decoded, nil
}

// All of the functions in this file assume that they are receiving a properly
// formatted private key.

// checkToken performs a MAC algorithm (where token is generated by hashing the
// message with the privateKey via GenerateToken) with the purpose of authenticating
// the validity of both the message and the private key of the person who generated
// the token.
func checkToken(message, token, privateKey string) error {
    tokenBytes, err := base64.URLEncoding.DecodeString(token)
    if err != nil {
        return errors.Wrap(err, errors.Fields{"token": token})
    }

    generatedToken, err := generateToken(message, privateKey)
    if err != nil {
        return errors.Wrap(err, errors.Fields{"token": token})
    }

    generatedBytes, err := base64.URLEncoding.DecodeString(generatedToken)
    if err != nil {
        return errors.Wrap(err, errors.Fields{"token": token})
    }

    if !hmac.Equal(tokenBytes, generatedBytes) {
        return errors.Forbidden(errors.Fields{"token": token}, "invalid token")
    }

    return nil
}

// generateToken generates a hash of the message with the privateKey via the
// sha256 algorithm.
func generateToken(message, privateKey string) (string, error) {
    key, err := base64.URLEncoding.DecodeString(privateKey)
    if err != nil {

```

```
return "", errors.Wrap(err, errors.Fields{"msg": message})
}

h := hmac.New(sha256.New, key)
h.Write([]byte(message))
return base64.URLEncoding.EncodeToString(h.Sum(nil)), nil
}
```

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```

Common libraries shared by Prometheus Go components.

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package model

```
import "time"
```

```
// A CheckResponse is the internal content of the PublicCheckResponse signed
```



```

// json blob.
type CheckResponse struct {
    Expiration    time.Time `json:"expiration"`
    Token         string    `json:"token"`
    MaxEngines    int      `json:"maxEngines"`
    ScanningEnabled bool     `json:"scanningEnabled"`
    Type          string    `json:"licenseType"`
    Tier          string    `json:"tier"`
}

// IssuedLicense represents an issued license
type IssuedLicense struct {
    KeyID         string `json:"key_id"`
    PrivateKey    string `json:"private_key"`
    Authorization string `json:"authorization"`
}

// Valid returns true if the License is syntactically valid, false otherwise
func (l *IssuedLicense) Valid() (bool, string) {
    if l.KeyID == "" {
        return false, "empty key_id"
    }

    if l.PrivateKey == "" {
        return false, "empty private_key"
    }

    if l.Authorization == "" {
        return false, "empty authorization"
    }

    return true, ""
}

```

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package engine

```
import (  
    "time"  
  
    "github.com/docker/cli/cli/command/formatter"  
    "github.com/docker/cli/internal/licenseutils"  
    "github.com/docker/licensing/model"  
)  
  
const (  
    defaultSubscriptionsTableFormat = "table"
```



```
{{.Num}}\t{{.Owner}}\t{{.ProductID}}\t{{.Expires}}\t{{.ComponentsString}}"
```

```
defaultSubscriptionsQuietFormat = "{{.Num}}:{{.Summary}}"
```

```
numHeader = "NUM"
```

```
ownerHeader = "OWNER"
```

```
licenseNameHeader = "NAME"
```

```
idHeader = "ID"
```

```
dockerIDHeader = "DOCKER ID"
```

```
productIDHeader = "PRODUCT ID"
```

```
productRatePlanHeader = "PRODUCT RATE PLAN"
```

```
productRatePlanIDHeader = "PRODUCT RATE PLAN ID"
```

```
startHeader = "START"
```

```
expiresHeader = "EXPIRES"
```

```
stateHeader = "STATE"
```

```
eusaHeader = "EUSA"
```

```
pricingComponentsHeader = "PRICING COMPONENTS"
```

```
)
```

```
// NewSubscriptionsFormat returns a Format for rendering using a license Context
```

```
func NewSubscriptionsFormat(source string, quiet bool) formatter.Format {
```

```
switch source {
```

```
case formatter.TableFormatKey:
```

```
if quiet {
```

```
return defaultSubscriptionsQuietFormat
```

```
}
```

```
return defaultSubscriptionsTableFormat
```

```
case formatter.RawFormatKey:
```

```
if quiet {
```

```
return `license: {{.ID}}`
```

```
}
```

```
return `license: {{.ID}}\nname: {{.Name}}\nowner: {{.Owner}}\ncomponents: {{.ComponentsString}}\n`
```

```
}
```

```
return formatter.Format(source)
```

```
}
```

```
// SubscriptionsWrite writes the context
```

```
func SubscriptionsWrite(ctx formatter.Context, subs []licenseutils.LicenseDisplay) error {
```

```
render := func(format func(subContext formatter.SubContext) error) error {
```

```
for _, sub := range subs {
```

```
licenseCtx := &licenseContext{trunc: ctx.Trunc, l: sub}
```

```
if err := format(licenseCtx); err != nil {
```

```
return err
```

```
}
```

```
}
```

```
return nil
```

```
}
```

```
licenseCtx := licenseContext{}
```

```
licenseCtx.Header = map[string]string{
```

```

"Num":      numHeader,
"Owner":    ownerHeader,
"Name":     licenseNameHeader,
"ID":       idHeader,
"DockerID": dockerIDHeader,
"ProductID": productIDHeader,
"ProductRatePlan": productRatePlanHeader,
"ProductRatePlanID": productRatePlanIDHeader,
"Start":    startHeader,
"Expires":  expiresHeader,
"State":    stateHeader,
"Eusa":     eusaHeader,
"ComponentsString": pricingComponentsHeader,
}
return ctx.Write(&licenseCtx, render)
}

type licenseContext struct {
    formatter.HeaderContext
    trunc bool
    l licenseutils.LicenseDisplay
}

func (c *licenseContext) MarshalJSON() ([]byte, error) {
    return formatter.MarshalJSON(c)
}

func (c *licenseContext) Num() int {
    return c.l.Num
}

func (c *licenseContext) Owner() string {
    return c.l.Owner
}

func (c *licenseContext) ComponentsString() string {
    return c.l.ComponentsString
}

func (c *licenseContext) Summary() string {
    return c.l.String()
}

func (c *licenseContext) Name() string {
    return c.l.Name
}

func (c *licenseContext) ID() string {

```

```

return c.l.ID
}

func (c *licenseContext) DockerID() string {
return c.l.DockerID
}

func (c *licenseContext) ProductID() string {
return c.l.ProductID
}

func (c *licenseContext) ProductRatePlan() string {
return c.l.ProductRatePlan
}

func (c *licenseContext) ProductRatePlanID() string {
return c.l.ProductRatePlanID
}

func (c *licenseContext) Start() *time.Time {
return c.l.Start
}

func (c *licenseContext) Expires() *time.Time {
return c.l.Expires
}

func (c *licenseContext) State() string {
return c.l.State
}

func (c *licenseContext) Eusa() *model.EusaState {
return c.l.Eusa
}

func (c *licenseContext) PricingComponents() []model.SubscriptionPricingComponent {
// Dereference the pricing component pointers in the pricing components
// so it can be rendered properly with the template formatter

var ret []model.SubscriptionPricingComponent
for _, spc := range c.l.PricingComponents {
if spc == nil {
continue
}
ret = append(ret, *spc)
}
return ret
}

```

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1.294 zstd 1.4.4+dfsg-3ubuntu0.1

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```

<signature of Ty Coon>, 1 April 1989

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*/

```
/* checkTag : validation tool for libzstd
* command :
* $ ./checkTag tag
* checkTag validates tags of following format : v[0-9].[0-9].[0-9]{any}
* The tag is then compared to zstd version number.
* They are compatible if first 3 digits are identical.
* Anything beyond that is free, and doesn't impact validation.
* Example : tag v1.8.1.2 is compatible with version 1.8.1
* When tag and version are not compatible, program exits with error code 1.
* When they are compatible, it exists with a code 0.
* checkTag is intended to be used in automated testing environment.
*/
```

1.295 swagger 2.1.9

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*/
```

Found in path(s):

```
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/SecuritySchemes.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/headers/Header.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/responses/ApiResponse.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/media/Encoding.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/Hidden.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/OAuthScope.java
```

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Schema.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/DiscriminatorMapping.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirement.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/Link.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/ExternalDocumentation.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Servers.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlow.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Server.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/ExampleObject.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/callbacks/Callbacks.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirements.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/OpenAPIDefinition.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/tags/Tags.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityScheme.java

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* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Operation.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameter.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameters.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Content.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponseResponses.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/info/Contact.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlows.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/info/License.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/tags/Tag.java

* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/parameters/RequestBody.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/callbacks/Callback.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/LinkParameter.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/extensions/Extensions.java
* /opt/cola/permits/1165124373_1631713413.68/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/ServerVariable.java

1.296 zlib 1.2.11.dfsg-2ubuntu1.1

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1.298 expat 2.2.9 1build1

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1.299 webrtc m44

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modules/audio_coding/codecs/g722/main/source/g722_enc_dec.h
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*

* From: Wilco Dijkstra <Wilco.Dijkstra@ntlworld.com>

* Date: Fri, Jun 24, 2011 at 3:20 AM

* Subject: Re: sqrt routine

* To: Kevin Ma <kma@google.com>

* Hi Kevin,

* Thanks for asking. Those routines are public domain (originally posted to

* comp.sys.arm a long time ago), so you can use them freely for any purpose.

* Cheers,

* Wilco

*

* ----- Original Message -----

* From: "Kevin Ma" <kma@google.com>

* To: <Wilco.Dijkstra@ntlworld.com>

* Sent: Thursday, June 23, 2011 11:44 PM

* Subject: Fwd: sqrt routine

* Hi Wilco,
* I saw your sqrt routine from several web sites, including
* <http://www.finesse.demon.co.uk/steven/sqrt.html>.
* Just wonder if there's any copyright information with your Successive
* approximation routines, or if I can freely use it for any purpose.
* Thanks.
* Kevin
*/

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*
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Files:

modules/audio_coding/codecs/g722/main/source/g722_decode.c
modules/audio_coding/codecs/g722/main/source/g722_enc_dec.h
modules/audio_coding/codecs/g722/main/source/g722_encode.c

License:

/*
* SpanDSP - a series of DSP components for telephony
*
* g722_decode.c - The ITU G.722 codec, decode part.
*
* Written by Steve Underwood <steveu@coppice.org>
*
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*
* Based in part on a single channel G.722 codec which is:
*
* Copyright (c) CMU 1993
* Computer Science, Speech Group
* Chengxiang Lu and Alex Hauptmann
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Files:

modules/audio_coding/codecs/isac/main/source/fft.c

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Files:

modules/audio_device/mac/portaudio/pa_memorybarrier.h
modules/audio_device/mac/portaudio/pa_ringbuffer.c
modules/audio_device/mac/portaudio/pa_ringbuffer.h

License:

/*
* \$Id: pa_memorybarrier.h 1240 2007-07-17 13:05:07Z bjornroche \$
* Portable Audio I/O Library
* Memory barrier utilities

*
* Author: Bjorn Roche, XO Audio, LLC
*
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*/

/*
* \$Id: pa_ringbuffer.c 1421 2009-11-18 16:09:05Z bjornroche \$
* Portable Audio I/O Library
* Ring Buffer utility.
*
* Author: Phil Burk, <http://www.softsynth.com>
* modified for SMP safety on Mac OS X by Bjorn Roche
* modified for SMP safety on Linux by Leland Lucius
* also, allowed for const where possible
* modified for multiple-byte-sized data elements by Sven Fischer

*
* Note that this is safe only for a single-thread reader and a
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*
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Files:

common_audio/fft4g.c
modules/audio_processing/aec/aec_rdfc.c

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system_wrappers/source/condition_variable_event_win.cc

Source:

<http://www1.cse.wustl.edu/~schmidt/ACE-copying.html>

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Files:

system_wrappers/source/set_thread_name_win.h

Source:

<http://msdn.microsoft.com/en-us/cc300389.aspx#P>

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system_wrappers/source/spreadsortlib/constants.hpp
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jar/io/netty/handler/codec/protobuf/ProtobufVarint32FrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ProtocolDetectionResult.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/protobuf/ProtobufDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/protobuf/ProtobufVarint32LengthFieldPrepender.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/protobuf/ProtobufEncoderNano.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/protobuf/ProtobufDecoderNano.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/UnsupportedValueConverter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ProtocolDetectionState.java
```

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/HeadersUtils.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufEncoder.java
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/EmptyHeaders.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/Headers.java
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/xml/XmlFrameDecoder.java
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jar/io/netty/handler/codec/compression/FastLzFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4FrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzmaFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2DivSufSort.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2HuffmanStageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/FastLz.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2MoveToFrontTable.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BlockCompressor.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/FastLzFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageAggregationException.java
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jar/io/netty/handler/codec/compression/Crc32.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/json/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2HuffmanStageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Decoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzfEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2MTFAndRLE2StageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BlockDecompressor.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4Constants.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderResultProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Lz4FrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Encoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/LzfDecoder.java
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jar/io/netty/handler/codec/compression/Bzip2BitWriter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Constants.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/compression/Bzip2HuffmanAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/json/JsonObjectDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2Rand.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFramedDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Bzip2BitReader.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ReferenceMap.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/CompatibleMarshallingDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/base64/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/CompactObjectInputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/TooLongFrameException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallingDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/PrematureChannelClosureException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/LimitingByteInput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/DecompressionException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/ThreadLocalUnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallingEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectEncoderOutputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/ChannelBufferByteOutput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CodecException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ReplayingDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/MessageToMessageEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/EncoderException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/bytes/ByteArrayDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassLoaderClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/UnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToMessageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LineBasedFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/UnsupportedMessageTypeException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ContextBoundUnmarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibUtil.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibWrapper.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ZlibCodecFactory.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ObjectDecoderInputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ByteToMessageCodec.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CorruptedFrameException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/StringEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/ClassResolvers.java
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jar/io/netty/handler/codec/compression/JZlibDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageAggregator.java
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jar/io/netty/handler/codec/base64/Base64Decoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/CompressionException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/base64/Base64Encoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ByteToMessageDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderException.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LengthFieldPrepender.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/SoftReferenceMap.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToMessageCodec.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/bytes/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/MessageToByteEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/DefaultMarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/StringDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/CompactObjectOutputStream.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/ReplayingDecoderByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DecoderResult.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/Delimiters.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/JZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/FixedLengthFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-

jar/io/netty/handler/codec/serialization/CachingClassResolver.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/SnappyFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/Snappy.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/CompatibleMarshallingEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ThreadLocalMarshallerProvider.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/marshalling/ChannelBufferByteInput.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/CompatibleObjectEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/serialization/WeakReferenceMap.java
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/LineSeparator.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/ByteBufChecksum.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DatagramPacketDecoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/string/LineEncoder.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CodecOutputList.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/compression/CompressionUtil.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DateFormatter.java

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DatagramPacketEncoder.java

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*/

/**

* A decoder that splits the received {@link ByteBuf}s dynamically by the
* value of the length field in the message. It is particularly useful when you
* decode a binary message which has an integer header field that represents the
* length of the message body or the whole message.

* <p>

* {@link LengthFieldBasedFrameDecoder} has many configuration parameters so
* that it can decode any message with a length field, which is often seen in
* proprietary client-server protocols. Here are some example that will give
* you the basic idea on which option does what.

*

* <h3>2 bytes length field at offset 0, do not strip header</h3>

*

* The value of the length field in this example is <tt>12 (0x0C)</tt> which
* represents the length of "HELLO, WORLD". By default, the decoder assumes
* that the length field represents the number of the bytes that follows the
* length field. Therefore, it can be decoded with the simplistic parameter
* combination.

* <pre>

* lengthFieldOffset = 0

* lengthFieldLength = 2

* lengthAdjustment = 0

* initialBytesToStrip = 0 (= do not strip header)

*

* BEFORE DECODE (14 bytes) AFTER DECODE (14 bytes)

* +-----+-----+ +-----+-----+

* | Length | Actual Content |---->| Length | Actual Content |

* | 0x00C | "HELLO, WORLD" | | 0x000C | "HELLO, WORLD" |

* +-----+-----+ +-----+-----+

```

* </pre>
*
* <h3>2 bytes length field at offset 0, strip header</h3>
*
* Because we can get the length of the content by calling
* { @link ByteBuf#readableBytes() }, you might want to strip the length
* field by specifying <tt>initialBytesToStrip</tt>. In this example, we
* specified <tt>2</tt>, that is same with the length of the length field, to
* strip the first two bytes.
* <pre>
* lengthFieldOffset = 0
* lengthFieldLength = 2
* lengthAdjustment = 0
* <b>initialBytesToStrip</b> = <b>2</b> (= the length of the Length field)
*
* BEFORE DECODE (14 bytes)      AFTER DECODE (12 bytes)
* +-----+-----+ +-----+
* | Length | Actual Content |---->| Actual Content |
* | 0x000C | "HELLO, WORLD" |   | "HELLO, WORLD" |
* +-----+-----+ +-----+
* </pre>
*
* <h3>2 bytes length field at offset 0, do not strip header, the length field
* represents the length of the whole message</h3>
*
* In most cases, the length field represents the length of the message body
* only, as shown in the previous examples. However, in some protocols, the
* length field represents the length of the whole message, including the
* message header. In such a case, we specify a non-zero
* <tt>lengthAdjustment</tt>. Because the length value in this example message
* is always greater than the body length by <tt>2</tt>, we specify <tt>-2</tt>
* as <tt>lengthAdjustment</tt> for compensation.
* <pre>
* lengthFieldOffset = 0
* lengthFieldLength = 2
* <b>lengthAdjustment</b> = <b>-2</b> (= the length of the Length field)
* initialBytesToStrip = 0
*
* BEFORE DECODE (14 bytes)      AFTER DECODE (14 bytes)
* +-----+-----+ +-----+-----+
* | Length | Actual Content |---->| Length | Actual Content |
* | 0x000E | "HELLO, WORLD" |   | 0x000E | "HELLO, WORLD" |
* +-----+-----+ +-----+-----+
* </pre>
*
* <h3>3 bytes length field at the end of 5 bytes header, do not strip header</h3>
*
* The following message is a simple variation of the first example. An extra

```

* header value is prepended to the message. `lengthAdjustment` is zero
 * again because the decoder always takes the length of the prepended data into
 * account during frame length calculation.

* `<pre>`

* `lengthFieldOffset` = 2 (= the length of Header 1)

* `lengthFieldLength` = 3

* `lengthAdjustment` = 0

* `initialBytesToStrip` = 0

*

* BEFORE DECODE (17 bytes) AFTER DECODE (17 bytes)

* +-----+-----+-----+ +-----+-----+-----+

* | Header 1 | Length | Actual Content |----->| Header 1 | Length | Actual Content |

* | 0xCAFE | 0x00000C | "HELLO, WORLD" | | 0xCAFE | 0x00000C | "HELLO, WORLD" |

* +-----+-----+-----+ +-----+-----+-----+

* `</pre>`

*

* `<h3>3 bytes length field at the beginning of 5 bytes header, do not strip header</h3>`

*

* This is an advanced example that shows the case where there is an extra
 * header between the length field and the message body. You have to specify a
 * positive `lengthAdjustment` so that the decoder counts the extra
 * header into the frame length calculation.

* `<pre>`

* `lengthFieldOffset` = 0

* `lengthFieldLength` = 3

* `lengthAdjustment` = 2 (= the length of Header 1)

* `initialBytesToStrip` = 0

*

* BEFORE DECODE (17 bytes) AFTER DECODE (17 bytes)

* +-----+-----+-----+ +-----+-----+-----+

* | Length | Header 1 | Actual Content |----->| Length | Header 1 | Actual Content |

* | 0x00000C | 0xCAFE | "HELLO, WORLD" | | 0x00000C | 0xCAFE | "HELLO, WORLD" |

* +-----+-----+-----+ +-----+-----+-----+

* `</pre>`

*

* `<h3>2 bytes length field at offset 1 in the middle of 4 bytes header,`

* `strip the first header field and the length field</h3>`

*

* This is a combination of all the examples above. There are the prepended
 * header before the length field and the extra header after the length field.
 * The prepended header affects the `lengthFieldOffset` and the extra
 * header affects the `lengthAdjustment`. We also specified a non-zero
 * `initialBytesToStrip` to strip the length field and the prepended
 * header from the frame. If you don't want to strip the prepended header, you
 * could specify `0` for `initialBytesToSkip`.

* `<pre>`

* `lengthFieldOffset` = 1 (= the length of HDR1)

* `lengthFieldLength` = 2

```

* <b>lengthAdjustment</b> = <b>1</b> (= the length of HDR2)
* <b>initialBytesToStrip</b> = <b>3</b> (= the length of HDR1 + LEN)
*
* BEFORE DECODE (16 bytes)          AFTER DECODE (13 bytes)
* +-----+-----+-----+-----+ +-----+-----+
* | HDR1 | Length | HDR2 | Actual Content |---->| HDR2 | Actual Content |
* | 0xCA | 0x00C | 0xFE | "HELLO, WORLD" |   | 0xFE | "HELLO, WORLD" |
* +-----+-----+-----+-----+ +-----+-----+
* </pre>
*
* <h3>2 bytes length field at offset 1 in the middle of 4 bytes header,
* strip the first header field and the length field, the length field
* represents the length of the whole message</h3>
*
* Let's give another twist to the previous example. The only difference from
* the previous example is that the length field represents the length of the
* whole message instead of the message body, just like the third example.
* We have to count the length of HDR1 and Length into <tt>lengthAdjustment</tt>.
* Please note that we don't need to take the length of HDR2 into account
* because the length field already includes the whole header length.
* <pre>
* lengthFieldOffset = 1
* lengthFieldLength = 2
* <b>lengthAdjustment</b> = <b>-3</b> (= the length of HDR1 + LEN, negative)
* <b>initialBytesToStrip</b> = <b>3</b>
*
* BEFORE DECODE (16 bytes)          AFTER DECODE (13 bytes)
* +-----+-----+-----+-----+ +-----+-----+
* | HDR1 | Length | HDR2 | Actual Content |---->| HDR2 | Actual Content |
* | 0xCA | 0x0010 | 0xFE | "HELLO, WORLD" |   | 0xFE | "HELLO, WORLD" |
* +-----+-----+-----+-----+ +-----+-----+
* </pre>
* @see LengthFieldPrepender
*/

```

Found in path(s):

```

* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/LengthFieldBasedFrameDecoder.java

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/**
* Enumeration of supported Base64 dialects.
* <p>
* The internal lookup tables in this class has been derived from
* <a href="http://iharder.sourceforge.net/current/java/base64/">Robert Harder's Public Domain
* Base64 Encoder/Decoder</a>.
*/
```

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```
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/DefaultHeadersImpl.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
jar/io/netty/handler/codec/CharSequenceValueConverter.java
* /opt/ws_local/PERMITS_SQL/1072948336_1595240763.12/0/netty-codec-4-1-51-final-sources-
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 */
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 */
/**
 * Utility class for {@link ByteBuf} that encodes and decodes to and from
 * Base64 notation.
 *
 * <p>
 * The encoding and decoding algorithm in this class has been derived from
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 \* Base64 Encoder/Decoder.
 *
 */
```

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```
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1.304 util-linux 2.20

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1.305 tcpdump 4.9.2

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1.308 nginx 1.18.0

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1.313 python-requests 2.25.1

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1.317 d-bus 1.10.8

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1.318 docker 1.9.1

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#
.gitignore
#
builds/unix/pkg.m4
#
docs/FTL.TXT
docs/GPLv2.TXT
#
include/freetype/internal/fthash.h
#
src/base/fthash.c
src/base/md5.c
src/base/md5.h
#
src/bdf/bdf.c
src/bdf/bdf.h
src/bdf/bdfdrivr.c
src/bdf/bdfdrivr.h
src/bdf/bdferror.h
src/bdf/bdfplib.c
src/bdf/module.mk
src/bdf/README
src/bdf/rules.mk
#
src/pcf/module.mk
src/pcf/pcf.c
src/pcf/pcf.h
src/pcf/pcfdrivr.c
src/pcf/pcfdrivr.h
src/pcf/pcferror.h
src/pcf/pcfread.c
src/pcf/pcfread.h
src/pcf/pcfutil.c
src/pcf/pcfutil.h
src/pcf/README
src/pcf/rules.mk
#
src/gzip/adler32.c
src/gzip/infblock.c
src/gzip/infblock.h
```

```
src/gzip/infcodes.c
src/gzip/infcodes.h
src/gzip/inffixed.h
src/gzip/inflate.c
src/gzip/inftrees.c
src/gzip/inftrees.h
src/gzip/infutil.c
src/gzip/infutil.h
src/gzip/zconf.h
src/gzip/zlib.h
src/gzip/zutil.c
src/gzip/zutil.h
#
src/tools/apinames.c
src/tools/ftrandom/ftrandom.c
#
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```

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#####

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version 0.1

##

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1.332 golang 1.15.1

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Alexander Demakin <alexander.demakin@gmail.com>
Alexander Dring <email@alex.d.ch>
Alexander F Rdseth <alexander.rodseth@appeartv.com>
Alexander Greim <alexxx@iltempo.de>
Alexander Guz <kalimatas@gmail.com>

Alexander Kauer <alexander@affine.space>
Alexander Kucherenko <alxkchr@gmail.com>
Alexander Larsson <alexander.larsson@gmail.com>
Alexander Lourier <aml@rulezz.ru>
Alexander Menzhinsky <amenzhinsky@gmail.com>
Alexander Morozov <lk4d4math@gmail.com>
Alexander Neumann <alexander@bumpern.de>
Alexander Nohe <alex.nohe427@gmail.com>
Alexander Orlov <alexander.orlov@loxal.net>
Alexander Pantyukhin <apantykhin@gmail.com>
Alexander Polcyn <apolcyn@google.com>
Alexander Rakoczy <alex@golang.org>
Alexander Reece <awreece@gmail.com>
Alexander Surma <surma@surmair.de>
Alexander Zhavnerchik <alex.vizor@gmail.com>
Alexander Zillion <alex@alexzillion.com>
Alexander Zolotov <goldifit@gmail.com>
Alexandr Mayorskiy <a.mayorskiy@corp.mail.ru>
Alexandre Cesaro <alexandre.cesaro@gmail.com>
Alexandre Fiori <fiorix@gmail.com>
Alexandre Maari <draeron@gmail.com>
Alexandre Normand <alexandre.normand@gmail.com>
Alexandre Parentea <aubonbeurre@gmail.com>
Alexandre Viau <alexandre@alexandreviau.net>
Alexandru Mooi <brtznr@gmail.com>
Alexei Sholik <alcosholik@gmail.com>
Alexey Alexandrov <aalexand@google.com>
Alexey Borzenkov <snaury@gmail.com>
Alexey Naidonov <alexey.naidyonov@gmail.com>
Alexey Neganov <neganovalexey@gmail.com>
Alexey Palazhchenko <alexey.palazhchenko@gmail.com>
Alexey Semenyuk <alexsemenyuk88@gmail.com>
Alexis Hildebrandt <surryhill@gmail.com>
Alexis Hunt <lexer@google.com>
Alexis Imperial-Legrand <ail@google.com>
Ali Farooq <ali.farooq0@pm.me>
Ali Rizvi-Santiago <arizvisa@gmail.com>
Aliaksandr Valialkin <valyala@gmail.com>
Alif Rachmawadi <subosito@gmail.com>
Allan Simon <allan.simon@supinfo.com>
Allen Li <ayatane@google.com>
Alok Menghrajani <alok.menghrajani@gmail.com>
Aman Gupta <aman@tmm1.net>
Amarjeet Anand <amarjeetanandsingh@gmail.com>
Amir Mohammad Saied <amir@gluegadget.com>
Amr Mohammed <merodiro@gmail.com>
Amrut Joshi <amrut.joshi@gmail.com>
An Long <aisk1988@gmail.com>

An Xiao <hac@zju.edu.cn>
Anand K. Mistry <anand@mistry.ninja>
Anders Pearson <anders@columbia.edu>
Anderson Queiroz <contato@andersonq.eti.br>
Andr Carvalho <asantostc@gmail.com>
Andr Martins <aanm90@gmail.com>
Andre Nathan <andrenth@gmail.com>
Andrea Nodari <andrea.nodari91@gmail.com>
Andrea Spadaccini <spadaccio@google.com>
Andreas Auernhammer <aead@mail.de>
Andreas Jellinghaus <andreas@ionisiert.de> <anj@google.com>
Andreas Litt <andreas.litt@gmail.com>
Andrei Enshin <b1os@bk.ru>
Andrei Gherzan <andrei@resin.io>
Andrei Korzhevskii <a.korzhevskiy@gmail.com>
Andrei Matei <andrei@cockroachlabs.com>
Andrei Tudor Clin <mail@acln.ro>
Andrei Vagin <avagin@google.com>
Andrei Vieru <euvieru@gmail.com>
Andres Erbsen <andreser@google.com>
Andres Lowrie <andres.lowrie@gmail.com>
Andrew Austin <andrewacht@gmail.com>
Andrew Balholm <andybalholm@gmail.com>
Andrew Benton <andrewmbenton@gmail.com>
Andrew Bonventre <andybons@chromium.org>
Andrew Braunstein <awbraunstein@gmail.com>
Andrew Bursavich <abursavich@gmail.com>
Andrew Ekstedt <andrew.ekstedt@gmail.com>
Andrew Etter <andrew.etter@gmail.com>
Andrew G. Morgan <agm@google.com>
Andrew Gerrand <adg@golang.org>
Andrew Harding <andrew@spacemonkey.com>
Andrew Jackura <ajackura@google.com>
Andrew Louis <alouis@digitalocean.com>
Andrew Lutomirski <andy@luto.us>
Andrew Medvedev <andrew.y.medvedev@gmail.com>
Andrew Pilloud <andrewpilloud@igneoussystems.com>
Andrew Pogrebnoy <absourd.noise@gmail.com>
Andrew Poydence <apoydence@pivotal.io>
Andrew Pritchard <awpritchard@gmail.com>
Andrew Radev <andrey.radev@gmail.com>
Andrew Skiba <skibaa@gmail.com>
Andrew Stormont <astormont@racktopsystems.com>
Andrew Stribblehill <ads@wompom.org>
Andrew Szeto <andrew@jabagawee.com>
Andrew Todd <andrew.todd@wework.com>
Andrew Werner <andrew@upthere.com> <awerner32@gmail.com>
Andrew Wilkins <axwalk@gmail.com>

Andrew Williams <williams.andrew@gmail.com>
Andrew Z Allen <me@andrewzallen.com>
Andrey Mirtchovski <mirtchovski@gmail.com>
Andrey Petrov <andrey.petrov@shazow.net>
Andrii Soldatenko <andrii.soldatenko@gmail.com>
Andrii Soluk <isoluchok@gmail.com>
Andriy Lytvynov <lytvynov.a.v@gmail.com>
Andrzej eel <andrii.zhezhel@gmail.com>
Andy Balholm <andy@balholm.com>
Andy Davis <andy@bigandian.com>
Andy Finkenstadt <afinkenstadt@zynga.com>
Andy Lindeman <andy@lindeman.io>
Andy Maloney <asmaloney@gmail.com>
Andy Pan <panjf2000@gmail.com>
Andy Walker <walkeraj@gmail.com>
Andy Wang <cbeuw.andy@gmail.com>
Andzej Maciusovic <andzej.maciusovic@gmail.com>
Anfernee Yongkun Gui <anfernee.gui@gmail.com>
Angelo Bulfone <mbulfone@gmail.com>
Anh Hai Trinh <anh.hai.trinh@gmail.com>
Anit Gandhi <anitgandhi@gmail.com>
Ankit Goyal <ankit3goyal@gmail.com>
Anmol Sethi <anmol@aubble.com>
Annirudh Prasad <annirudh@wandb.com>
Anschel Schaffer-Cohen <anschelsc@gmail.com>
Anthony Alves <cvballa3g0@gmail.com>
Anthony Canino <anthony.canino1@gmail.com>
Anthony Eufemio <anthony.eufemio@gmail.com>
Anthony Fok <foka@debian.org>
Anthony Martin <alidity@pbrane.org>
Anthony Sottile <asottile@umich.edu>
Anthony Starks <ajstarks@gmail.com>
Anthony Voutas <voutasaurus@gmail.com>
Anthony Woods <awoods@raintank.io>
Antoine GIRARD <sapk@sapk.fr>
Antoine Martin <antoine97.martin@gmail.com>
Anton Gyllenberg <anton@iki.fi>
Anton Kuklin <anton.a.kuklin@gmail.com>
Antonin Amand <antonin.amand@gmail.com>
Antonio Antelo <aantelov87@gmail.com>
Antonio Bibiano <antbbn@gmail.com>
Antonio Huete Jimenez <tuxillo@quantumachine.net>
Antonio Murdaca <runcom@redhat.com>
Antonio Troina <thoeni@gmail.com>
Anze Kolar <me@akolar.com>
Aofei Sheng <aofei@aofeisheng.com>
Apisak Darakananda <pongad@gmail.com>
Aram Hvrneanu <aram@mgk.ro>

Araragi Hokuto <kanseihonbucho@protonmail.com>
Arash Bina <arash@arash.io>
Arda Gl <ardaguclu@gmail.com>
Areski Belaid <areski@gmail.com>
Ariel Mashraki <ariel@mashraki.co.il>
Arkadi Pyuro <arkadi@google.com>
Arlo Breault <arlolra@gmail.com>
Arnaud Ysmal <arnaud.ysmal@gmail.com>
Arne Hormann <arnehormann@gmail.com>
Arnout Engelen <arnout@bzzt.net>
Aron Nopanen <aron.nopanen@gmail.com>
Artem Alekseev <artem.alekseev@intel.com>
Artem Kolin <artemkaxboy@gmail.com>
Arthur Fabre <arthur@arthurfabre.com>
Arthur Khashaev <arthur@khashaev.ru>
Artyom Pervukhin <artyom.pervukhin@gmail.com>
Arvindh Rajesh Tamilmani <art@a-30.net>
Ashish Gandhi <ag@ashishgandhi.org>
Asim Shankar <asimshankar@gmail.com>
Atin Malaviya <amalaviy@akamai.com>
Ato Araki <ato.araki@gmail.com>
Audrey Lim <audreylh@gmail.com>
Audrius Butkevicius <audrius.butkevicius@gmail.com>
Augusto Roman <aroman@gmail.com>
Aulus Egnatius Varialus <varialus@gmail.com>
Aurlien Rainone <aurelien.rainone@gmail.com>
Aurlio A. Heckert <aurium@gmail.com>
Austin Clements <austin@google.com> <aclements@csail.mit.edu>
Avi Flax <avi@timehop.com>
awaw fumin <awawfumin@gmail.com>
Awn Umar <awn@cryptolosophy.io>
Axel Wagner <axel.wagner.hh@googlemail.com>
Ayan George <ayan@ayan.net>
Ayanamist Yang <ayanamist@gmail.com>
Ayke van Laethem <aykevanlaethem@gmail.com>
Aymerick Jhanne <aymerick@jehanne.org>
Azat Kaumov <kaumov.a.r@gmail.com>
Baiju Muthukadan <baiju.m.mail@gmail.com>
Balaram Makam <bmakam.qdt@qualcommdatacenter.com>
Balazs Lecz <leczb@google.com>
Baokun Lee <nototon@gmail.com>
Barnaby Keene <accounts@southcla.ws>
Bartosz Grzybowski <melkorm@gmail.com>
Bartosz Oler <brtsz@google.com>
Bastian Ike <bastian.ike@gmail.com>
Ben Burkert <ben@benburkert.com>
Ben Eitzen <eitzenb@golang.org>
Ben Fried <ben.fried@gmail.com>

Ben Haines <bhainesva@gmail.com>
Ben Hoyt <benhoyt@gmail.com>
Ben Laurie <ben@links.org> <benl@google.com>
Ben Lubar <ben.lubar@gmail.com>
Ben Lynn <benlynn@gmail.com>
Ben Olive <sionide21@gmail.com>
Ben Schwartz <bemasc@google.com>
Ben Shi <powerman1st@163.com>
Ben Toews <mastahyeti@gmail.com>
Benjamin Black <b@b3k.us>
Benjamin Cable <cable.benjamin@gmail.com>
Benjamin Hsieh <tanookiben@users.noreply.github.com>
Benjamin Peterson <benjamin@python.org>
Benjamin Prosnitz <bprosnitz@google.com>
Benjamin Wester <bwester@squareup.com>
Benjamin Wuethrich <benjamin.wuethrich@gmail.com>
Benny Siegert <bsiegert@gmail.com>
Benoit Sigoure <tsunanet@gmail.com>
Berengar Lehr <Berengar.Lehr@gmx.de>
Berkant Ipek <41230766+0xbkt@users.noreply.github.com>
Bharath Thiruveedula <tbharath91@gmail.com>
Bhavin Gandhi <bhavin7392@gmail.com>
Bill Neubauer <wcn@golang.org> <wcn@google.com> <bill.neubauer@gmail.com>
Bill O'Farrell <billo@ca.ibm.com>
Bill Prin <waprin@google.com>
Bill Thiede <couchmoney@gmail.com>
Bill Zissimopoulos <billziss@navimatics.com>
Billie Harold Cleek <bhcleek@gmail.com>
Billy Lynch <wlynch@google.com>
Billy Zaelani Malik <m.billyzaelani@gmail.com>
Bjrn Erik Pedersen <bjorn.erik.pedersen@gmail.com>
Bjorn Tillenius <bjorn@tillenius.me>
Bjorn Tipling <bjorn.tipling@gmail.com>
Blain Smith <rebelgeek@blainsmith.com>
Blake Gentry <blakesgentry@gmail.com>
Blake Mesdag <blakemesdag@gmail.com>
Blake Mizerany <blake.mizerany@gmail.com>
Blixt <me@blixt.nyc>
Bob Briski <rbriski@gmail.com>
Bob McNaughton <bobmcn@gmail.com>
Bob Potter <bobby.potter@gmail.com>
Bobby DeSimone <bobbydesimone@gmail.com>
Bobby Powers <bobbypowers@gmail.com>
Boqin Qin <bobbqqin@gmail.com>
Boris Nagaev <nagaev@google.com>
Borja Clemente <borja.clemente@gmail.com>
Brad Burch <brad.burch@gmail.com>
Brad Erickson <bderickson@gmail.com>

Brad Fitzpatrick <bradfitz@golang.org> <bradfitz@gmail.com>
Brad Garcia <bgarcia@golang.org>
Brad Jones <rbjones@google.com>
Brad Morgan <brad@morgabra.com>
Brad Whitaker <bwhitaker@fastly.com>
Braden Bassingthwaite <bbassingthwaite@vendasta.com>
Bradford Lamson-Scribner <brad.lamson@gmail.com>
Bradley Falzon <brad@teambrod.net>
Brady Catherman <brady@gmail.com>
Brady Sullivan <brady@bsull.com>
Brandon Bennett <bbennett@fb.com>
Brandon Gilmore <varz@google.com>
Brandon Philips <brandon@ifup.org>
Brandon Ryan <bjryan19@gmail.com>
Brayden Cloud <bcloud@google.com>
Brendan Daniel Tracey <tracey.brendan@gmail.com>
Brendan O'Dea <bod@golang.org>
Brett Cannon <bcannon@gmail.com>
Brett Merrill <brett.j.merrill94@gmail.com>
Brian Dellisanti <briandellisanti@gmail.com>
Brian Downs <brian.downs@gmail.com>
Brian Falk <falk@logicparty.org>
Brian G. Merrell <bgmerrell@gmail.com>
Brian Gitonga Marete <marete@toshnix.com> <bgmarete@gmail.com> <bgm@google.com>
Brian Kennedy <btkennedy@gmail.com>
Brian Kessler <brian.m.kessler@gmail.com>
Brian Ketelsen <bketelsen@gmail.com>
Brian Slesinsky <skybrian@google.com>
Brian Smith <ohohvi@gmail.com>
Brian Starke <brian.starke@gmail.com>
Bryan Alexander <Kozical@msn.com>
Bryan C. Mills <bcmills@google.com>
Bryan Chan <bryan.chan@ca.ibm.com>
Bryan Ford <brynosaurus@gmail.com>
Bryan Heden <b.heden@gmail.com>
Bulat Gaifullin <gaifullinbf@gmail.com>
Burak Guven <bguven@gmail.com>
Caine Tighe <arctanofyourface@gmail.com>
Caio Marcelo de Oliveira Filho <caio.oliveira@intel.com>
Caleb Martinez <accounts@calebmartinez.com>
Caleb Spare <cespare@gmail.com>
Carl Chatfield <carlchatfield@gmail.com>
Carl Henrik Lunde <chlunde@ifi.uio.no>
Carl Jackson <carl@stripe.com>
Carl Johnson <me@carlmjohnson.net>
Carl Mastrangelo <notcarl@google.com>
Carl Shapiro <cshapiro@google.com> <cshapiro@golang.org>
Carlisia Campos <carlisia@grokkingtech.io>

Carlo Alberto Ferraris <cafxx@strayorange.com>
Carlos Amedee <carlos@golang.org>
Carlos Castillo <cookieo9@gmail.com>
Carlos Cirello <uldericofilho@gmail.com>
Carlos Eduardo <me@carlosedp.com>
Carlos Eduardo Seo <cseo@linux.vnet.ibm.com>
Carlos Iriarte <ciriarte@gmail.com>
Carlos Souza <carloshrsouza@gmail.com>
Carolyn Van Slyck <me@carolynvanslyck.com>
Carrie Bynon <cbynon@gmail.com>
Cary Hull <chull@google.com>
Case Nelson <case.nelson@gmail.com>
Casey Callendrello <squeed@gmail.com>
Casey Marshall <casey.marshall@gmail.com>
Catalin Nicutar <cnicutar@google.com>
Catalin Patulea <catalinp@google.com>
Cedric Staub <cs@squareup.com>
Cezar S Espinola <cezarsa@gmail.com>
Chad Rosier <mrosier.qdt@qualcommdatacenter.com>
ChaiShushan <chaishushan@gmail.com>
Changkun Ou <hi@changkun.us>
Channing Kimble-Brown <channing@golang.org>
Chao Xu <xuchao@google.com>
Charles Fenwick Elliott <Charles@FenwickElliott.io>
Charles Kenney <charlesc.kenney@gmail.com>
Charles L. Dorian <cldorian@gmail.com>
Charles Lee <zombie.fml@gmail.com>
Charles Weill <weill@google.com>
Chauncy Cullitan <chauncyc@google.com>
Chen Zhihan <energiehund@gmail.com>
Cherry Zhang <cherryyz@google.com>
Chew Choon Keat <choonkeat@gmail.com>
Cholerae Hu <choleraehyq@gmail.com>
Chotepud Teo <AlexRouSg@users.noreply.github.com>
Chris Ball <chris@printf.net>
Chris Biscardi <chris@christopherbiscardi.com>
Chris Broadfoot <cbro@golang.org>
Chris Dollin <ehog.hedge@gmail.com>
Chris Farmiloe <chrisfarms@gmail.com>
Chris Hines <chris.cs.guy@gmail.com>
Chris Howey <howeyc@gmail.com>
Chris Hundt <hundt@google.com>
Chris Jones <chris@cjones.org> <chris.jones.yar@gmail.com>
Chris Kastorff <encryptio@gmail.com>
Chris Le Roy <brompwnie@users.noreply.github.com>
Chris Lennert <calennert@gmail.com>
Chris Liles <caveryliles@gmail.com>
Chris Manghane <cmang@golang.org>

Chris Marchesi <chrism@vanclueverttech.com>
Chris McGee <sirnewton_01@yahoo.ca> <newton688@gmail.com>
Chris Raynor <raynor@google.com>
Chris Roche <rodaine@gmail.com>
Chris Smith <chrsmith@users.noreply.github.com>
Chris Stockton <chrisstocktonaz@gmail.com>
Chris Zou <chriszou@ca.ibm.com>
Christian Alexander <christian@linux.com>
Christian Couder <chriscool@tuxfamily.org>
Christian Himpel <chressie@googlemail.com> <chressie@gmail.com>
Christian Muehlhaeuser <muesli@gmail.com>
Christian Pellegrin <chri@evolware.org>
Christian R. Petrin <christianpetrin@gmail.com>
Christine Hansmann <chhansmann@gmail.com>
Christoffer Buchholz <christoffer.buchholz@gmail.com>
Christoph Blecker <admin@toph.ca>
Christoph Hack <christoph@tux21b.org>
Christopher Cahoon <chris.cahoon@gmail.com>
Christopher Guiney <chris@guiney.net>
Christopher Henderson <chris@chenderson.org>
Christopher Koch <chrisko@google.com>
Christopher Loessl <cloessl+github@gmail.com>
Christopher Nelson <nadiasvertex@gmail.com>
Christopher Nielsen <m4dh4tt3r@gmail.com>
Christopher Redden <christopher.redden@gmail.com>
Christopher Swenson <cswenson@google.com>
Christopher Wedgwood <cw@f00f.org>
Christos Zoulas <christos@zoulas.com> <zoulasc@gmail.com>
Christy Perez <christy@linux.vnet.ibm.com>
CL Sung <clsung@gmail.com> <cl_sung@htc.com>
Clement Chigot <clement.chigot@atos.net>
Clement Skau <clementskau@gmail.com>
Clint J. Edwards <clint.j.edwards@gmail.com>
Cody Oss <the.cody.oss@gmail.com>
Colby Ranger <cranger@google.com>
Colin Arnott <colin@urandom.co.uk>
Colin Cross <ccross@android.com>
Colin Edwards <colin@recursivepenguin.com>
Colin Kennedy <moshen.colin@gmail.com>
Colin Nelson <colnnelson@google.com>
Colin Rice <clr@google.com>
Conrad Irwin <conrad.irwin@gmail.com>
Conrad Meyer <cemeyer@cs.washington.edu>
Conrado Gouvea <conradopl@gmail.com>
Constantin Konstantinidis <constantinkonstantinidis@gmail.com>
Corey Thomasson <cthom.lists@gmail.com>
Corne van der Plas <vdplas@gmail.com>
Cosmos Nicolaou <cnicolaou@google.com>

Costin Chirvasuta <ctin@google.com>
Craig Citro <craigcitro@google.com>
Cristian Staretu <unclejacksons@gmail.com>
Cuihtlauac ALVARADO <cuihtlauac.alvarado@orange.com>
Cyrill Schumacher <cyrill@schumacher.fm>
Daisuke Fujita <dtanshi45@gmail.com>
Daisuke Suzuki <daisuzu@gmail.com>
Daker Fernandes Pinheiro <daker.fernandes.pinheiro@intel.com>
Damian Gryski <dgryski@gmail.com>
Damien Lespiau <damien.lespiau@gmail.com> <damien.lespiau@intel.com>
Damien Mathieu <42@dmathieu.com>
Damien Neil <dneil@google.com>
Damien Tournoud <damien@platform.sh>
Dan Ballard <dan@mindstab.net>
Dan Caddigan <goldcaddy77@gmail.com>
Dan Callahan <dan.callahan@gmail.com>
Dan Harrington <harringtond@google.com>
Dan Jacques <dnj@google.com>
Dan Johnson <computerdruid@google.com>
Dan Peterson <dpiddy@gmail.com>
Dan Pupius <dan@medium.com>
Dan Scales <danscales@google.com>
Dan Sinclair <dan.sinclair@gmail.com>
Daniel Cormier <danielc@knowbe4.com>
Danil de Kok <me@danieldk.eu>
Daniel Fleischman <danielfleischman@gmail.com>
Daniel Ingram <ingramds@appstate.edu>
Daniel Johansson <dajo2002@gmail.com>
Daniel Kerwin <d.kerwin@gini.net>
Daniel Krech <eikeon@eikeon.com>
Daniel Kumor <rdkumor@gmail.com>
Daniel Langner <s8572327@gmail.com>
Daniel Lidn <daniel.liden.87@gmail.com>
Daniel Lublin <daniel@lublin.se>
Daniel Mangum <georgedanielmangum@gmail.com>
Daniel Mart <mvdan@mvdan.cc>
Daniel Morsing <daniel.morsing@gmail.com>
Daniel Nadasi <dnadasi@google.com>
Daniel Nephin <dnephin@gmail.com>
Daniel Ortiz Pereira da Silva <daniel.particular@gmail.com>
Daniel Skinner <daniel@dasa.cc>
Daniel Speichert <daniel@speichert.pl>
Daniel Theophanes <kardianos@gmail.com>
Daniel Upton <daniel@floppy.co>
Daniela Petruzalek <daniela.petruzalek@gmail.com>
Danish Dua <danishdua@google.com>
Danish Prakash <grafitykoncept@gmail.com>
Danny Rosseau <daniel.rosseau@gmail.com>

Daria Kolistratova <daria.kolistratova@intel.com>
Darien Raymond <admin@v2ray.com>
Darren Elwood <darren@textnode.com>
Darren Grant <darren.e.grant@gmail.com>
Darren McCleary <darren.rmc@gmail.com>
Darshan Parajuli <parajulidarshan@gmail.com>
Datong Sun <dndx@idndx.com>
Dave Borowitz <dborowitz@google.com>
Dave Bort <dbort@golang.org>
Dave Cheney <dave@cheney.net>
Dave Day <djd@golang.org>
Dave Grijalva <dgrijalva@ngmoco.com>
Dave MacFarlane <driusan@gmail.com>
Dave Russell <forfuncsake@gmail.com>
David Anderson <danderson@google.com>
David Barnett <dbarnett@google.com>
David Benjamin <davidben@google.com>
David Bond <davidsbond93@gmail.com>
David Brophy <dave@brophy.uk>
David Brgin <676c7473@gmail.com>
David Calavera <david.calavera@gmail.com>
David Carlier <devnexen@gmail.com>
David Carter <fresco.raja@gmail.com>
David Chase <drchase@google.com>
David Covert <davidhcovert@gmail.com>
David Crawshaw <david.crawshaw@zentus.com> <crawshaw@google.com> <crawshaw@golang.org>
David du Colombier <0intro@gmail.com>
David Finkel <david.finkel@gmail.com>
David Forsythe <dforsythe@gmail.com>
David G. Andersen <dave.andersen@gmail.com>
David Glasser <glasser@meteor.com>
David Golden <david@autoprismatic.com>
David Heuschmann <heuschmann.d@gmail.com>
David Howden <dhowden@gmail.com>
David Hubbard <dsp@google.com>
David Jakob Fritz <david.jakob.fritz@gmail.com>
David Jones <dxjones@gmail.com>
David Lazar <lazard@golang.org>
David Leon Gil <coruus@gmail.com>
David McLeish <davemc@google.com>
David Ndungu <dnjuguna@gmail.com>
David NewHamlet <david@newhamlet.com>
David Presotto <presotto@gmail.com>
David R. Jenni <david.r.jenni@gmail.com>
David Sansome <me@davidsansome.com>
David Stainton <dstainton415@gmail.com>
David Symonds <dsymonds@golang.org>
David Thomas <davidthomas426@gmail.com>

David Timm <dtimm@pivotal.io>
David Titarenco <david.titarenco@gmail.com>
David Tolpin <david.tolpin@gmail.com>
David Url <david@urld.io>
David Volquartz Lebech <david@lebech.info>
David Wimmer <davidlwimmer@gmail.com>
Davies Liu <davies.liu@gmail.com>
Davor Kapsa <davor.kapsa@gmail.com>
Dean Eigenmann <7621705+decanus@users.noreply.github.com>
Dean Prichard <dean.prichard@gmail.com>
Deepak Jois <deepak.jois@gmail.com>
Denis Bernard <db047h@gmail.com>
Denis Brandolini <denis.brandolini@gmail.com>
Denis Isaev <idenx@yandex.com>
Denis Nagorny <denis.nagorny@intel.com>
Dennis Kuhnert <mail.kuhnert@gmail.com>
Denys Honsiorovskyi <honsiorovskyi@gmail.com>
Denys Smirnov <denis.smirnov.91@gmail.com>
Derek Buitenhuis <derek.buitenhuis@gmail.com>
Derek Che <drc@yahoo-inc.com>
Derek McGowan <derek@mcgstyle.net>
Derek Parker <parkerderek86@gmail.com>
Derek Phan <derekphan94@gmail.com>
Derek Shockey <derek.shockey@gmail.com>
Dev Ojha <dojha12@gmail.com>
Dev Zhoujun <dev.zhoujun@gmail.com>
Devon H. O'Dell <devon.odell@gmail.com>
Dhaivat Pandit <dhaivatpandit@gmail.com>
Dhananjay Nakrani <dhananjayn@google.com>
Dhiru Kholia <dhiru.kholia@gmail.com>
Dhruvduddh Jadhav <dhrvduddh.jadhav@gmail.com>
Di Xiao <dixiao@google.com>
Didier Spezia <didier.06@gmail.com>
Diego Siqueira <diego9889@gmail.com>
Dieter Plaetinck <dieter@raintank.io>
Dimitri Sokolyuk <sokolyuk@gmail.com>
Dimitri Tcaciuc <dtcaciuc@gmail.com>
Dina Garmash <dgrmsh@gmail.com>
Diogo Pinela <diogoid7400@gmail.com>
Dirk Gadsden <dirk@esherido.com>
Diwaker Gupta <diwakergupta@gmail.com>
Dmitri Goutnik <dgoutnik@gmail.com>
Dmitri Popov <operator@cv.dp-net.com>
Dmitri Shuralyov <dmitshur@golang.org> <dmitri@shuralyov.com>
Dmitriy Cherchenko <dcherchenko@gmail.com>
Dmitriy Dudkin <dudkin.dmitriy@gmail.com>
Dmitriy Shelenin <deemok@googlemail.com> <deemok@gmail.com>
Dmitriy Vyukov <dvyukov@google.com>

Dmitry Chestnykh <dchest@gmail.com>
Dmitry Doroginin <doroginin@gmail.com>
Dmitry Mottl <dmitry.mottl@gmail.com>
Dmitry Neverov <dmitry.neverov@gmail.com>
Dmitry Savintsev <dsavints@gmail.com>
Dmitry Yakunin <nonamezeil@gmail.com>
Doga Fincan <doga@icloud.com>
Domas Tamauskas <puerdomus@gmail.com>
Domen Ipavec <domen@ipavec.net>
Dominic Green <dominicgreen1@gmail.com>
Dominik Honnef <dominik.honnef@gmail.com>
Dominik Vogt <vogt@linux.vnet.ibm.com>
Don Byington <don@dbyington.com>
Donald Huang <don.hcd@gmail.com>
Dong-hee Na <donghee.na92@gmail.com>
Donovan Hide <donovanhide@gmail.com>
Doug Anderson <douga@google.com>
Doug Fawley <dfawley@google.com>
Douglas Danger Manley <doug.manley@gmail.com>
Drew Flower <drewvanstone@gmail.com>
Drew Hintz <adhintz@google.com>
Duco van Amstel <duco.vanamstel@gmail.com>
Duncan Holm <mail@frou.org>
Dustin Carlino <dcarlino@google.com>
Dustin Herbison <djherbis@gmail.com>
Dustin Long <dustmop@gmail.com>
Dustin Sallings <dsallings@gmail.com>
Dustin Shields-Cloues <dcloues@gmail.com>
Dvir Volk <dvir@everything.me> <dvirsky@gmail.com>
Dylan Waits <dylan@waits.io>
Ed Schouten <ed@nuxi.nl>
Edan Bedrik <3d4nb3@gmail.com>
Eddie Scholtz <escholtz@google.com>
Eden Li <eden.li@gmail.com>
Eduard Urbach <e.urbach@gmail.com>
Eduardo Ramalho <eduardo.ramalho@gmail.com>
Eduardo Villaseor <evillasrmx@gmail.com>
Edward Muller <edwardam@interlix.com>
Egon Elbre <egonelbre@gmail.com>
Ehren Kret <ehren.kret@gmail.com>
Eitan Adler <lists@eitanadler.com>
Eivind Uggedal <eivind@uggedal.com>
Elbert Fliek <efliek@gmail.com>
Eldar Rakhimberdin <ibeono@gmail.com>
Elena Grahovac <elena@grahovac.me>
Eli Bendersky <eliben@google.com>
Elias Naur <mail@eliasnaur.com> <elias.naur@gmail.com>
Elliot Morrison-Reed <elliottmr@gmail.com>

Ellison Leao <ellisonleao@gmail.com>
Emerson Lin <linyintor@gmail.com>
Emil Hessman <emil@hessman.se>
Emil Mursalimov <mursalimovemeel@gmail.com>
Emilien Kenler <hello@emilienkenler.com>
Emmanuel Odeke <emm.odeke@gmail.com> <odeke@ualberta.ca>
Emreacan Bati <emreacanbati@gmail.com>
Eno Compton <enocom@google.com>
Eoghan Sherry <ejsherry@gmail.com>
Eric Biggers <ebiggers@google.com>
Eric Brown <browne@vmware.com>
Eric Chiang <eric.chiang.m@gmail.com>
Eric Clark <zerohp@gmail.com>
Eric Daniels <eric@erdaniels.com>
Eric Engestrom <eric@engestrom.ch>
Eric Garrido <ekg@google.com>
Eric Koleda <ekoleda+devrel@google.com>
Eric Lagergren <ericscottlagergren@gmail.com>
Eric Milliken <emilliken@gmail.com>
Eric Pauley <eric@pauley.me>
Eric Ponce <tricokun@gmail.com>
Eric Rescorla <ekr@rtfm.com>
Eric Roshan-Eisner <eric.d.eisner@gmail.com>
Eric Rutherford <erutherford@gmail.com>
Eric Rykwaldler <e.rykwaldler@gmail.com>
Erick Tryzelaar <etryzelaar@google.com>
Erik Aigner <aigner.erik@gmail.com>
Erik Dubbelboer <erik@dubbelboer.com>
Erik St. Martin <alakriti@gmail.com>
Erik Staab <estaab@google.com>
Erik Westrup <erik.westrup@gmail.com>
Erin Masatsugu <erin.masatsugu@gmail.com>
Ernest Chiang <ernest_chiang@htc.com>
Erwin Oegema <blablaechthema@hotmail.com>
Esko Luontola <esko.luontola@gmail.com>
Ethan Burns <eaburns@google.com>
Ethan Miller <eamiller@us.ibm.com>
Euan Kemp <euank@euank.com>
Eugene Formanenko <mo4islona@gmail.com>
Eugene Kalinin <e.v.kalinin@gmail.com>
Evan Broder <evan@stripe.com>
Evan Brown <evanbrown@google.com>
Evan Digby <evandigby@gmail.com>
Evan Hicks <evan.hicks2@gmail.com>
Evan Jones <ej@evanjones.ca>
Evan Klitzke <evan@eklitzke.org>
Evan Kroske <evankroske@google.com>
Evan Martin <evan.martin@gmail.com>

Evan Phoenix <evan@phx.io>
Evan Shaw <chickencha@gmail.com>
Evgeniy Kulikov <tuxuls@gmail.com>
Evgeniy Polyakov <zbr@iorem.net>
Ewan Chou <coocood@gmail.com>
Ewan Valentine <ewan.valentine89@gmail.com>
Eyal Posener <posener@gmail.com>
Fabian Wickborn <fabian@wickborn.net>
Fabian Zaremba <fabian@youreemail.eu>
Fabrizio Milo <mistobaan@gmail.com>
Faiyaz Ahmed <ahmedf@vmware.com>
Fan Hongjian <fan.howard@gmail.com>
Fangming Fang <fangming.fang@arm.com>
Fannie Zhang <fannie.zhang@arm.com>
Fatih Arslan <fatih@arslan.io>
Fazal Majid <majid@apsalar.com>
Fazlul Shahriar <fshahriar@gmail.com>
Federico Bond <federicobond@gmail.com>
Federico Simoncelli <fsimonce@redhat.com>
Fedor Indutny <fedor@indutny.com>
Fedor Korotkiy <dartslon@gmail.com>
Felipe Oliveira <felipeweb.programador@gmail.com>
Felix Bnemann <Felix.Buenemann@gmail.com>
Felix Cornelius <9767036+fcornelius@users.noreply.github.com>
Felix Geisendrfer <haimuiba@gmail.com>
Felix Kollmann <fk@konsorten.de>
Ferenc Szabo <frncmx@gmail.com>
Filip Gruszczyski <gruszczyski@gmail.com>
Filip Haglund <drathier@users.noreply.github.com>
Filip Stanis <fstanis@google.com>
Filippo Valsorda <filippo@golang.org> <filippo@cloudflare.com> <hi@filippo.io>
Firmansyah Adiputra <frm.adiputra@gmail.com>
Florian Forster <octo@google.com>
Florian Uekermann <florian@uekermann-online.de> <f1@uekermann-online.de>
Florian Weimer <fw@deneb.enyo.de>
Florin Patan <florinpatan@gmail.com>
Folke Behrens <folke@google.com>
Ford Hurley <ford.hurley@gmail.com>
Francesc Campoy <campoy@golang.org>
Francesco Renzi <rentziass@gmail.com>
Francisco Claude <fclaude@recoded.cl>
Francisco Rojas <francisco.rojas.gallegos@gmail.com>
Francisco Souza <franciscossouza@gmail.com>
Frank Schroeder <frank.schroeder@gmail.com>
Frank Somers <fsomers@arista.com>
Frederic Guillot <frederic.guillot@gmail.com>
Frederick Kelly Mayle III <frederickmayle@gmail.com>
Frederik Ring <frederik.ring@gmail.com>

Frederik Zipp <fzipp@gmx.de>
Fredrik Enestad <fredrik.enestad@soundtrackyourbrand.com>
Fredrik Forsmo <fredrik.forsmo@gmail.com>
Fredrik Wallgren <fredrik.wallgren@gmail.com>
Frew Schmidt <github@frew.co>
Frithjof Schulze <schulze@math.uni-hannover.de> <sfrithjof@gmail.com>
Frits van Bommel <fvbommel@gmail.com>
Fujimoto Kyosuke <kyoro.f@gmail.com>
Fumitoshi Ukai <ukai@google.com>
G. Hussain Chinoy <ghchinoy@gmail.com>
Gaal Yahas <gaal@google.com>
Gabrel Arthr Ptursson <gabriel@system.is>
Gabriel Aszalos <gabriel.aszalos@gmail.com>
Gabriel Guzman <gabe.guzman@gmail.com>
Gabriel Nelle <tehsphinx@web.de>
Gabriel Nicolas Avellaneda <avellaneda.gabriel@gmail.com>
Gabriel Rosenhouse <rosenhouse@gmail.com>
Gabriel Russell <gabriel.russell@gmail.com>
Gareth Paul Jones <gpj@foursquare.com>
Garret Kelly <gdk@google.com>
Garrick Evans <garrick@google.com>
Gary Burd <gary@beagledreams.com> <gary.burd@gmail.com>
Gary Elliott <garyelliott@google.com>
Gaurish Sharma <contact@gaurishsharma.com>
Gautham Thambidorai <gautham.dorai@gmail.com>
Gauthier Jolly <gauthier.jolly@gmail.com>
Gawen Arab <gawen.arab@c.zen.ly>
Geert-Johan Riemer <gjr19912@gmail.com>
Genevieve Luyt <genevieve.luyt@gmail.com>
Gengliang Wang <ltnwgl@gmail.com>
Geoff Berry <gberry.qdt@qualcommdatacenter.com>
Geoffroy Lorieux <lorieux.g@gmail.com>
Geon Kim <geon0250@gmail.com>
Georg Reinke <guelfey@gmail.com>
George Gkirtsou <ggirtsou@gmail.com>
George Hartzell <hartzell@alerce.com>
George Shammass <george@shamm.as> <georgyo@gmail.com>
Gerasimos (Makis) Maropoulos <kataras2006@hotmail.com>
Gerasimos Dimitriadis <gedimitr@gmail.com>
Gergely Brautigam <skarlso777@gmail.com>
Gernot Vormayr <gvormayr@gmail.com>
Gert Cuykens <gert.cuykens@gmail.com>
Getulio Snchez <valentin2507@gmail.com>
Ghazni Nattarshah <ghazni.nattarshah@gmail.com>
Gianguido Sora` <g.sora4@gmail.com>
Gideon Jan-Wessel Redelinghuys <gjredelinghuys@gmail.com>
Giles Lean <giles.lean@pobox.com>
Giovanni Bajo <rasky@develer.com>

GitHub User @aca (50316549) <acadx0@gmail.com>
GitHub User @ajnrp (1688456) <ajnrp@users.noreply.github.com>
GitHub User @ajz01 (4744634) <ajzdenek@gmail.com>
GitHub User @alkesh26 (1019076) <alkesh26@gmail.com>
GitHub User @andig (184815) <cpuidle@gmx.de>
GitHub User @andrius4669 (4699695) <andrius4669@gmail.com>
GitHub User @as (8127015) <as.utf8@gmail.com>
GitHub User @bakape (7851952) <bakape@gmail.com>
GitHub User @bgadrian (830001) <aditza8@gmail.com>
GitHub User @bontequero (2674999) <bontequero@gmail.com>
GitHub User @cch123 (384546) <buaa.cch@gmail.com>
GitHub User @chainhelen (7046329) <chainhelen@gmail.com>
GitHub User @chanxuehong (3416908) <chanxuehong@gmail.com>
GitHub User @cncal (23520240) <flycalvin@qq.com>
GitHub User @DQNEO (188741) <dqneo@gmail.com>
GitHub User @Dreamacro (8615343) <chuainian@gmail.com>
GitHub User @dupoxy (1143957) <dupoxy@users.noreply.github.com>
GitHub User @erifan (31343225) <eric.fang@arm.com>
GitHub User @esell (9735165) <eujon.sellers@gmail.com>
GitHub User @fatedier (7346661) <fatedier@gmail.com>
GitHub User @frenkie (6499251) <mail@rhab.de>
GitHub User @geedchin (11672310) <geedchin@gmail.com>
GitHub User @GrigoriyMikhalkin (3637857) <grigoriymikhalkin@gmail.com>
GitHub User @hengwu0 (41297446) <41297446+hengwu0@users.noreply.github.com>
GitHub User @itchyny (375258) <itchyny@hatena.ne.jp>
GitHub User @jinmiaoluo (39730824) <jinmiaoluo@icloud.com>
GitHub User @jobbrown (6345470) <msshane2008@gmail.com>
GitHub User @kazysr (30496953) <kazysr0301@gmail.com>
GitHub User @kc1212 (1093806) <kc1212@users.noreply.github.com>
GitHub User @Kropekk (13366453) <kamilkropiewnicki@gmail.com>
GitHub User @linguohua (3434367) <lghchinaidea@gmail.com>
GitHub User @LotusFenn (13775899) <fenn.lotus@gmail.com>
GitHub User @ly303550688 (11519839) <yang.liu636@gmail.com>
GitHub User @madiganz (18340029) <zacharymadigan@gmail.com>
GitHub User @maltalex (10195391) <code@bit48.net>
GitHub User @Matt966 (28551465) <Matt966@users.noreply.github.com>
GitHub User @micnncim (21333876) <micnncim@gmail.com>
GitHub User @mkishere (224617) <224617+mkishere@users.noreply.github.com>
GitHub User @nu50218 (40682920) <nu_ll@icloud.com>
GitHub User @OlgaVlPetrova (44112727) <OVPPetrova@gmail.com>
GitHub User @pityonline (438222) <pityonline@gmail.com>
GitHub User @po3rin (29445112) <abctail30@gmail.com>
GitHub User @pokutuna (57545) <popopopokutuna@gmail.com>
GitHub User @pytimer (17105586) <lixin20101023@gmail.com>
GitHub User @ramenjuniti (32011829) <ramenjuniti@gmail.com>
GitHub User @saitarunreddy (21041941) <saitarunreddypalla@gmail.com>
GitHub User @shogo-ma (9860598) <Chorama194@gmail.com>
GitHub User @skanehira (7888591) <sho19921005@gmail.com>

GitHub User @tatsumack (4510569) <tatsu.mack@gmail.com>
GitHub User @tell-k (26263) <ffk2005@gmail.com>
GitHub User @tennashi (10219626) <tennashio@gmail.com>
GitHub User @uhei (2116845) <uhei@users.noreply.github.com>
GitHub User @uropek (39370426) <uropek@gmail.com>
GitHub User @utkarsh-extc (53217283) <utkarsh.extc@gmail.com>
GitHub User @witchard (4994659) <witchard@hotmail.co.uk>
GitHub User @yah01 (12216890) <kagaminehuan@gmail.com>
GitHub User @yuanhh (1298735) <yuan415030@gmail.com>
GitHub User @zikaeroh (48577114) <zikaeroh@gmail.com>
GitHub User @ZZMarquis (7624583) <zhonglingjian3821@163.com>
Giulio Iotti <dullgiulio@gmail.com>
Giulio Micheloni <giulio.micheloni@gmail.com>
Giuseppe Valente <gvalente@arista.com>
Gleb Stepanov <glebstepanov1992@gmail.com>
Glenn Brown <glennb@google.com>
Glenn Lewis <gmlewis@google.com>
Gordon Klaus <gordon.klaus@gmail.com>
Gordon Tyler <gordon@doxxx.net>
Graham King <graham4king@gmail.com>
Graham Miller <graham.miller@gmail.com>
Grant Griffiths <ggp493@gmail.com>
Greg Poirier <greg.istehbest@gmail.com>
Greg Steuck <gneздо+github@google.com>
Greg Thelen <gthelen@google.com>
Greg Ward <greg@gerg.ca>
Grgoire Delattre <gregoire.delattre@gmail.com>
Gregory Man <man.gregory@gmail.com>
Gregory Petrosyan <gregory.petrosyan@gmail.com>
Guilherme Caruso <gui.martinscaruso@gmail.com>
Guilherme Garnier <guilherme.garnier@gmail.com>
Guilherme Goncalves <guilhermeaugustosg@gmail.com>
Guilherme Rezende <guilhermebr@gmail.com>
Guillaume J. Charmes <guillaume@charmes.net>
Gnther Noack <gnoack@google.com>
Guobiao Mei <meiguobiao@gmail.com>
Guoliang Wang <iamwgliang@gmail.com>
Gustav Paul <gustav.paul@gmail.com>
Gustav Westling <gustav@westling.xyz>
Gustavo Franco <gustavorfranco@gmail.com>
Gustavo Niemeyer <gustavo@niemeyer.net> <n13m3y3r@gmail.com>
Gwenael Treguier <gwenn.kahz@gmail.com>
Gyu-Ho Lee <gyuhox@gmail.com>
H. brahim Gngr <igungor@gmail.com>
Hajime Hoshi <hajimehoshi@gmail.com>
Hallgrimur Gunnarsson <halg@google.com>
HAMANO Tsukasa <hamano@osstech.co.jp>
Han-Wen Nienhuys <hanwen@google.com>

Hang Qian <hangqian90@gmail.com>
Hanjun Kim <hallazzang@gmail.com>
Haosdent Huang <haosdent@gmail.com>
Harald Nordgren <haraldnordgren@gmail.com>
Hari haran <hariharan.uno@gmail.com>
Hariharan Srinath <srinathh@gmail.com>
Harley Laue <losinggeneration@gmail.com>
Harry Moreno <morenoh149@gmail.com>
Harshavardhana <hrshvardhana@gmail.com>
Hasan Ozgan <hasan@ozgan.net>
Hasit Bhatt <hasit.p.bhatt@gmail.com>
Hauke Lffler <hloeffler@users.noreply.github.com>
Hvard Haugen <havard.haugen@gmail.com>
He Liu <liulonnie@gmail.com>
Hector Chu <hectorchu@gmail.com>
Hector Martin Cantero <hector@marcansoft.com>
Henning Schmiedehausen <henning@schmiedehausen.org>
Henrik Edwards <henrik.edwards@gmail.com>
Henrik Hodne <henrik@hodne.io>
Henry Adi Sumarto <henry.adisumarto@gmail.com>
Henry Bubert <google@mindeco.de>
Henry Chang <mr.changyuheng@gmail.com>
Henry Clifford <h.a.clifford@gmail.com>
Henry Wong <liushuai.wang@elastic.co>
Herbert Georg Fischer <herbert.fischer@gmail.com>
Herbie Ong <herbie@google.com>
Heschi Kreinick <heschi@google.com>
Hidetatsu Yaginuma <ygnmhdt@gmail.com>
Hilko Bengen <bengen@hilluzination.de>
Hiroaki Nakamura <hnakamur@gmail.com>
Hiromichi Ema <ema.hiro@gmail.com>
Hironao OTSUBO <motemen@gmail.com>
Hiroshi Ioka <hirochachacha@gmail.com>
Hitoshi Mitake <mitake.hitoshi@gmail.com>
Holden Huang <ttyh061@gmail.com>
Hong Ruiqi <hongruiqi@gmail.com>
Hongfei Tan <feilengcui008@gmail.com>
Horacio Duran <horacio.duran@gmail.com>
Horst Rutter <hhrutter@gmail.com>
Hossein Sheikh Attar <hattar@google.com>
Howard Zhang <howard.zhang@arm.com>
Hsin Tsao <tsao@google.com>
Hsin-Ho Yeh <yhh92u@gmail.com>
Hu Keping <hukeping@huawei.com>
Huan Du <i@huandu.me>
Hugues Bruant <hugues.bruant@gmail.com>
Huy Le <huy.dinh.le.89@gmail.com>
Hyang-Ah Hana Kim <hakim@google.com> <hyangah@gmail.com>

Hyoyoung Chang <hyoyoung@gmail.com>
Ian Cottrell <iancottrell@google.com>
Ian Davis <nospam@iandavis.com>
Ian Gudger <ian@loosescre.ws>
Ian Haken <ihaken@netflix.com>
Ian Kent <iankent85@gmail.com>
Ian Lance Taylor <iant@golang.org>
Ian Leue <ian@appboy.com>
Ian Zapolsky <ianzapolsky@gmail.com>
Ibrahim AshShohail <ibra.sho@gmail.com>
Icarus Sparry <golang@icarus.freeuk.com>
Iccha Sethi <icchasethi@gmail.com>
Idora Shinatose <idora.shinatose@gmail.com>
Ignacio Hagopian <jsign.uy@gmail.com>
Igor Bernstein <igorbernstein@google.com>
Igor Dolzhevik <bluesriverz@gmail.com>
Igor Vashyst <ivashyst@gmail.com>
Igor Zhilianin <igor.zhilianin@gmail.com>
Illya Yalovyy <yalovoy@gmail.com>
Ilya Sinelnikov <sidhmangh@gmail.com>
Ilya Tocar <ilya.tocar@intel.com>
INADA Naoki <songofacandy@gmail.com>
Inanc Gumus <m@inanc.io>
Ingo Gottwald <in.gottwald@gmail.com>
Ingo Krabbe <ikrabbe.ask@gmail.com>
Ingo Oeser <nightlyone@googlemail.com> <nightlyone@gmail.com>
Ioannis Georgoulas <geototti21@hotmail.com>
Irbe Krumina <irbekrm@gmail.com>
Irfan Sharif <irfanmahmoudsharif@gmail.com>
Irieda Noboru <irieda@gmail.com>
Isaac Ardis <isaac.ardis@gmail.com>
Isaac Wagner <ibw@isaacwagner.me>
Isfan Azhabil <isfanazhabil@gmail.com>
Iskander Sharipov <iskander.sharipov@intel.com> <quasilyte@gmail.com>
Issac Trotts <issactrotts@google.com>
Ivan Babrou <ivan@cloudflare.com>
Ivan Bertona <ivan.bertona@gmail.com>
Ivan Krasin <krasin@golang.org>
Ivan Kutuzov <arbrix@gmail.com>
Ivan Markin <sw@nogoegst.net>
Ivan Moscoso <moscoso@gmail.com>
Ivan Osadchii <ivan.osadchii@gmail.com>
Ivan Sharavuev <shpiwan@gmail.com>
Ivan Trubach <mr.trubach@icloud.com>
Ivan Ukhov <ivan.ukhov@gmail.com>
Ivy Evans <ivy@ivyevans.net>
Jaana Burcu Dogan <jbd@google.com> <jbd@golang.org> <burcujdogan@gmail.com>
Jaap Aarts <jaap.aarts1@gmail.com>

Jack Britton <jackxbritton@gmail.com>
Jack Lindamood <jlindamo@justin.tv>
Jacob Baskin <jbaskin@google.com>
Jacob Blain Christen <dweomer5@gmail.com>
Jacob H. Haven <jacob@cloudflare.com>
Jacob Hoffman-Andrews <github@hoffman-andrews.com>
Jacob Walker <jacobwalker0814@gmail.com>
Jae Kwon <jae@tendermint.com>
Jake B <doogie1012@gmail.com>
Jakob Borg <jakob@nym.se>
Jakob Weisblat <jakobw@mit.edu>
Jakub ajka <jcajka@redhat.com>
Jakub Kaczmarzyk <jakubk@mit.edu>
Jakub Ryszard Czarnowicz <j.czarnowicz@gmail.com>
Jamal Carvalho <jamal.a.carvalho@gmail.com>
James Aguilar <jaguilar@google.com>
James Bardin <j.bardin@gmail.com>
James Chacon <jchacon@google.com>
James Clarke <jrtc27@jrtc27.com>
James Cowgill <James.Cowgill@imgtec.com>
James Craig Burley <james-github@burleyarch.com>
James David Chalfant <james.chalfant@gmail.com>
James Eady <jmeady@google.com>
James Fysh <james.fysh@gmail.com>
James Gray <james@james4k.com>
James Hartig <fastest963@gmail.com>
James Lawrence <jljatone@gmail.com>
James Meneghello <rawrz0r@gmail.com>
James Myers <jfmyers9@gmail.com>
James Neve <jamesoneve@gmail.com>
James Nugent <james@jen20.com>
James P. Cooper <jamespcooper@gmail.com>
James Robinson <jamesr@google.com> <jamesr.gatech@gmail.com>
James Schofield <james@shoeboxapp.com>
James Smith <jrs1995@icloud.com>
James Sweet <james.sweet88@googlemail.com>
James Toy <nil@opensesame.st>
James Treanor <jtreanor3@gmail.com>
James Tucker <raggi@google.com>
James Whitehead <jnwhiteh@gmail.com>
Jamie Beverly <jamie.r.beverly@gmail.com>
Jamie Gennis <jgennis@google.com> <jgennis@gmail.com>
Jamie Kerr <jkerr113@googlemail.com>
Jamie Liu <jamieliu@google.com>
Jamie Stackhouse <contin673@gmail.com>
Jamie Turner <jamwt@dropbox.com>
Jamie Wilkinson <jaq@spacepants.org>
Jamil Djadala <djadala@gmail.com>

Jan Berktold <jan@berktold.co>
Jan H. Hosang <jan.hosang@gmail.com>
Jan Kratochvil <jan.kratochvil@redhat.com>
Jan Lehnardt <jan@apache.org>
Jan Mercl <0xjnml@gmail.com> <befelemepeseveze@gmail.com>
Jan Newmarch <jan.newmarch@gmail.com>
Jan Pilzer <jan.pilzer@gmx.de>
Jan Steinke <jan.steinke@gmail.com>
Jan Ziak <0xe2.0x9a.0x9b@gmail.com>
Jani Monoses <jani.monoses@ubuntu.com> <jani.monoses@gmail.com>
Jannis Andrija Schnitzer <jannis@schnitzer.im>
Jared Allard <jaredallard@users.noreply.github.com>
Jared Culp <jculp14@gmail.com>
Jaroslav Poepko <jp@webmaster.ms>
Jason A. Donenfeld <Jason@zx2c4.com>
Jason Baker <jason-baker@users.noreply.github.com>
Jason Barnett <jason.w.barnett@gmail.com>
Jason Buberel <jbuberel@google.com>
Jason Chu <jasonchujc@gmail.com>
Jason Del Ponte <delpontej@gmail.com>
Jason Hall <jasonhall@google.com>
Jason Keene <jasonkeene@gmail.com>
Jason LeBrun <jblebrun@gmail.com>
Jason Smale <jsmale@zendesk.com>
Jason Travis <infomaniac7@gmail.com>
Jason Wangsadinata <jwangsadinata@gmail.com>
Javier Kohen <jkohen@google.com>
Javier Revillas <jrevillas@massivedynamic.io>
Javier Segura <javism@gmail.com>
Jay Conrod <jayconrod@google.com>
Jay Taylor <outtatime@gmail.com>
Jay Weisskopf <jay@jayschwa.net>
Jean de Klerk <deklerk@google.com>
Jean-Andr Santoni <jean.andre.santoni@gmail.com>
Jean-Franois Bustarret <jf@bustarret.com>
Jean-Francois Cantin <jfcantin@gmail.com>
Jean-Marc Eurin <jmeurin@google.com>
Jean-Nicolas Moal <jn.moal@gmail.com>
Jed Denlea <jed@fastly.com>
Jdrzej Szczepaniak <jbszczepaniak@gmail.com>
Jeet Parekh <jeetparekh96@gmail.com>
Jeevanandam M <jeeva@myjeeva.com>
Jeff (Zhefu) Jiang <jeffjiang@google.com>
Jeff Craig <jeffcraig@google.com>
Jeff Dupont <jeff.dupont@gmail.com>
Jeff Hodges <jeff@somethingsimilar.com>
Jeff Johnson <jrjohnson@google.com>
Jeff R. Allen <jra@nella.org> <jeff.allen@gmail.com>

Jeff Sickel <jas@corpus-callosum.com>
Jeff Wendling <jeff@spacemonkey.com>
Jeffrey H <jeffreyh192@gmail.com>
Jelte Fennema <github-tech@jeltef.nl>
Jens Frederich <jfrederich@gmail.com>
Jeremiah Harmsen <jeremiah@google.com>
Jeremy Banks <_@jeremy.ca>
Jeremy Canady <jcanady@gmail.com>
Jeremy Faller <jeremy@golang.org>
Jeremy Jackins <jeremyjackins@gmail.com>
Jeremy Jay <jeremy@pbnjay.com>
Jeremy Schlatter <jeremy.schlatter@gmail.com>
Jeroen Bobbeldijk <jerbob92@gmail.com>
Jeroen Simonetti <jeroen@simonetti.nl>
Jerrin Shaji George <jerrinsg@gmail.com>
Jess Frazelle <me@jessfraz.com>
Jesse Szwedko <jesse.szwedko@gmail.com>
Jess Espino <jespinog@gmail.com>
Jia Zhan <jzhan@uber.com>
Jiacai Liu <jiacai2050@gmail.com>
Jianing Yu <jnyu@google.com>
Jianqiao Li <jianqiaoli@google.com>
Jie Ma <jienius@outlook.com>
Jihyun Yu <yjh0502@gmail.com>
Jim Cote <jfcote87@gmail.com>
Jim Kingdon <jim@bolt.me>
Jim McGrath <jimmc2@gmail.com>
Jim Minter <jminter@redhat.com>
Jimmy Frasche <soapboxcicero@gmail.com>
Jimmy Zelinskie <jimmyzelinskie@gmail.com>
Jin-wook Jeong <jeweljar@hanmail.net>
Jingcheng Zhang <diogin@gmail.com>
Jingguo Yao <yaojingguo@gmail.com>
Jingnan Si <jingnan.si@gmail.com>
Jinkun Zhang <franksnolf@gmail.com>
Jiong Du <londevil@gmail.com>
Jirka Dank <dnk@mail.muni.cz>
Jiulong Wang <jiulongw@gmail.com>
Joakim Sernbrant <serbaut@gmail.com>
Joe Bowbeer <joe.bowbeer@gmail.com>
Joe Cortopassi <joe@joecortopassi.com>
Joe Farrell <joe2farrell@gmail.com>
Joe Harrison <joehazzers@gmail.com>
Joe Henke <joed.henke@gmail.com>
Joe Kyo <xunianzu@gmail.com>
Joe Poirier <jdpoirier@gmail.com>
Joe Richey <joerichey@google.com>
Joe Shaw <joe@joeshaw.org>

Joe Sylve <joe.sylve@gmail.com>
Joe Tsai <joetsai@digital-static.net>
Joel Sing <joel@sing.id.au> <jsing@google.com>
Jol Stemmer <jstemmer@google.com>
Joel Stemmer <stemmertech@gmail.com>
Joey Geiger <jgeiger@users.noreply.github.com>
Johan Brandhorst <johan.brandhorst@gmail.com>
Johan Euphrosine <proppy@google.com>
Johan Jansson <johan.jansson@iki.fi>
Johan Sageryd <j@1616.se>
John Asmuth <jasmuth@gmail.com>
John Beisley <huin@google.com>
John C Barstow <jbowtie@amathaine.com>
John DeNero <denero@google.com>
John Dethridge <jcd@golang.org>
John Gibb <johngibb@gmail.com>
John Gilik <john@jgilik.com>
John Graham-Cumming <jgc@jgc.org> <jgrahamc@gmail.com>
John Howard Palevich <jack.palevich@gmail.com>
John Jeffery <jjeffery@sp.com.au>
John Jenkins <twodopeshaggy@gmail.com>
John Leidegren <john.leidegren@gmail.com>
John McCabe <john@johnmccabe.net>
John Moore <johnkenneth.moore@gmail.com>
John Newlin <jnewlin@google.com>
John Papandriopoulos <jpap.code@gmail.com>
John Potocny <johnp@vividcortex.com>
John R. Lenton <jlenton@gmail.com>
John Schnake <schnake.john@gmail.com>
John Shahid <jvshahid@gmail.com>
John Tuley <john@tuley.org>
John Weldon <johnweldon4@gmail.com>
Johnny Luo <johnnyluo1980@gmail.com>
Jon Chen <jchen@justin.tv>
Jon Johnson <jonjohnson@google.com>
Jonas Bernoulli <jonas@bernoul.li>
Jonathan Allie <jonallie@google.com>
Jonathan Amsterdam <jba@google.com>
Jonathan Boule <jonathanboule@gmail.com>
Jonathan Chen <dijonkitchen@users.noreply.github.com>
Jonathan Feinberg <feinberg@google.com>
Jonathan Gold <jgold.bg@gmail.com>
Jonathan Hseu <jhseu@google.com>
Jonathan Mark <jhmark@xenops.com> <jhmark000@gmail.com>
Jonathan Nieder <jrn@google.com>
Jonathan Pentecost <pentecostjonathan@gmail.com>
Jonathan Pittman <jmpittman@google.com> <jonathan.mark.pittman@gmail.com>
Jonathan Rudenberg <jonathan@titanous.com>

Jonathan Stacks <jonstacks13@gmail.com>
Jonathan Wills <runningwild@gmail.com>
Jonathon Lacher <jonathon.lacher@gmail.com>
Jongmin Kim <atomaths@gmail.com>
Joonas Kuorilehto <joneskoo@derbian.fi>
Joop Kiefte <ikojba@gmail.com> <joop@kiefte.net>
Jordan Christiansen <xordspar0@gmail.com>
Jordan Krage <jmank88@gmail.com>
Jordan Lewis <jordanthelewis@gmail.com>
Jordan Liggitt <liggitt@google.com>
Jordan Rhee <jordanrh@microsoft.com>
Jordi Martin <jordimartin@gmail.com>
Jorge Araya <jorgejavieran@yahoo.com.mx>
Jorge L. Fatta <jorge.fatta@auth0.com>
Jos Visser <josv@google.com>
Josa Gesell <josa@gesell.me>
Jose Luis Vzquez Gonzlez <josvazg@gmail.com>
Joseph Bonneau <jcb@google.com>
Joseph Holsten <joseph@josephholsten.com>
Josh Baum <joshbaum@google.com>
Josh Bleecher Snyder <josharian@gmail.com>
Josh Chorlton <jchorlton@gmail.com>
Josh Deprez <josh.deprez@gmail.com>
Josh Goebel <dreamer3@gmail.com>
Josh Hoak <jhoak@google.com>
Josh Holland <jrh@joshh.co.uk>
Josh Roppo <joshroppo@gmail.com>
Josh Varga <josh.varga@gmail.com>
Joshua Bezaleel Abednego <joshua.bezaleel@gmail.com>
Joshua Boelter <joshua.boelter@intel.com>
Joshua Chase <jcjosuachase@gmail.com>
Joshua Crowgey <jcrowgey@uw.edu>
Joshua M. Clulow <josh.clulow@joyent.com>
Joshua Rubin <joshua@rubixconsulting.com>
Josselin Costanzi <josselin@costanzi.fr>
Jostein Stuhaug <js@solidsystem.no>
JP Sugarbroad <jpsugar@google.com>
JT Olds <jtolds@xnet5.com>
JT Olio <hello@jtolio.com>
Juan Carlos <juanjcsr@gmail.com>
Juan Pablo Civile <elementohb@gmail.com>
Jude Pereira <judebpereira@gmail.com>
Jukka-Pekka Kekkonen <karatepekka@gmail.com>
Julia Hansbrough <flowerhack@google.com>
Julian Kornberger <jk+github@digineo.de>
Julian Pastarmov <pastarmovj@google.com>
Julian Phillips <julian@quantumfyre.co.uk>
Julian Tibble <julian.tibble@gmail.com>

Julie Qiu <julie@golang.org>
Julien Kauffmann <julien.kauffmann@freelan.org>
Julien Salleyron <julien.salleyron@gmail.com>
Julien Schmidt <google@julienschmidt.com>
Julio Montes <julio.montes@intel.com>
Jun Zhang <jim.zoumo@gmail.com>
Junda Liu <junda@celer.network>
Jungho Ahn <jhahn@google.com>
Junya Hayashi <ledmonster@gmail.com>
Juraj Sukop <sukop@users.noreply.github.com>
Jure Ham <jure.ham@zemanta.com>
Justin Gracenin <jgracenin@gmail.com>
Justin Li <git@justinli.net>
Justin Nu <nuss.justin@gmail.com>
Justyn Temme <justyntemme@gmail.com>
Kai Backman <kaib@golang.org>
Kai Dong <dokia2357@gmail.com>
Kai Trukenmiller <ktye78@gmail.com>
Kale Blankenship <kale@lemnisis.com>
Kaleb Elwert <kelwert@atlassian.com>
Kalman Bekesi <kalmanb@google.com>
Kamal Aboul-Hosn <aboulhosn@google.com>
Kamil Chmielewski <kamil.chm@gmail.com>
Kamil Kisiel <kamil@kamilkisiel.net> <kamil.kisiel@gmail.com>
Kamil Rytarowski <krytarowski@users.noreply.github.com>
Kang Hu <hukangustc@gmail.com>
Kanta Ebihara <kantaebihara@gmail.com>
Karan Dhiman <karandhi@ca.ibm.com>
Karel Pazdera <pazderak@gmail.com>
Karoly Negyesi <chx1975@gmail.com>
Karsten Khler <karsten.koehler95@gmail.com>
Karthik Nayak <karthik.188@gmail.com>
Kashav Madan <kshvmdn@gmail.com>
Kate Manson <kate.manson@izettle.com>
Katharine Berry <ktbry@google.com>
Katie Hockman <katie@golang.org>
Kato Kazuyoshi <kato.kazuyoshi@gmail.com>
Katrina Owen <katrina.owen@gmail.com>
Kaviraj Kanagaraj <kavirajkanagaraj@gmail.com>
Kay Zhu <kayzhu@google.com>
Kazuhiro Sera <seratch@gmail.com>
KB Sriram <kbsriram@google.com>
Keegan Carruthers-Smith <keegan.csmith@gmail.com>
Kei Son <hey.calmdown@gmail.com>
Keiji Yoshida <keijiyoshida.mail@gmail.com>
Keisuke Kishimoto <keisuke.kishimoto@gmail.com>
Keith Ball <inflatablewoman@gmail.com>
Keith Randall <khr@golang.org>

Keith Rarick <kr@xph.us>
Kelly Heller <pestophagous@gmail.com>
Kelsey Hightower <kelsey.hightower@gmail.com>
Kelvin Foo Chuan Lyi <vmirage@gmail.com>
Ken Friedenbach <kenliz@cruzio.com>
Ken Rockot <ken@oz.gs> <ken.rockot@gmail.com>
Ken Sedgwick <ken@bonsai.com>
Ken Thompson <ken@golang.org>
Kenichi Tsunokawa <kenichi.tsunokawa@gmail.com>
Kenji Kaneda <kenji.kaneda@gmail.com>
Kenji Yano <kenji.yano@gmail.com>
Kenneth Shaw <kenshaw@gmail.com>
Kenny Grant <kennygrant@gmail.com>
Kenta Mori <zoncoen@gmail.com>
Kerollos Magdy <kerolloz@yahoo.com>
Ketan Parmar <ketanbparmar@gmail.com>
Kevan Swanberg <kevswanberg@gmail.com>
Kevin Ballard <kevin@sb.org>
Kevin Burke <kev@inburke.com>
Kvin Dunglas <dunglas@gmail.com>
Kevin Gillette <extemporalgenome@gmail.com>
Kevin Kirsche <kev.kirsche@gmail.com>
Kevin Klues <klueska@gmail.com> <klueska@google.com>
Kevin Malachowski <chowski@google.com>
Kevin Ruffin <kruffin@gmail.com>
Kevin Vu <kevin.m.vu@gmail.com>
Kevin Zita <bleedgreenandgold@gmail.com>
Keyan Pishdadian <kpishdadian@gmail.com>
Kezhu Wang <kezhuw@gmail.com>
Khosrow Moossavi <khos2ow@gmail.com>
Kieran Colford <kieran@kcolford.com>
Kim Shrier <kshrier@racktopsystems.com>
Kim Yongbin <kybinz@gmail.com>
Kir Kolyshkin <kolyshkin@gmail.com>
Kirill Korotaev <kirillx@gmail.com>
Kirill Motkov <Motkov.Kirill@gmail.com>
Kirill Smelkov <kirr@nexedi.com>
Kirill Tatchihin <kirabsuir@gmail.com>
Kirk Han <kirk91.han@gmail.com>
Kirklin McDonald <kirklin.mcdonald@gmail.com>
Klaus Post <klauspost@gmail.com>
Kodie Goodwin <kodiegoodwin@gmail.com>
Koichi Shiraishi <zchee.io@gmail.com>
Koki Ide <niconegoto@yahoo.co.jp>
Koki Tomoshige <tomocy.dev@gmail.com>
Komu Wairagu <komuw05@gmail.com>
Konstantin <konstantin8105@gmail.com>
Konstantin Shaposhnikov <k.shaposhnikov@gmail.com>

Koya IWAMURA <kiwamura0314@gmail.com>
Kris Kwiatkowski <kris@cloudflare.com>
Kris Nova <kris@nivenly.com>
Kris Rousey <krousey@google.com>
Kristopher Watts <traetox@gmail.com>
Kshitij Saraogi <kshitijgaraogi@gmail.com>
Kun Li <likunarmstrong@gmail.com>
Kunpei Sakai <namusyaka@gmail.com>
Kuntal Majumder <hellozee@disroot.org>
Kush Patel <kush.patel@hootsuite.com>
Kyle Consalus <consalus@gmail.com>
Kyle Isom <kyle@gokyle.net>
Kyle Jones <kyle@kyledj.com>
Kyle Lemons <kyle@kylelemons.net> <kevlar@google.com>
Kyle Nusbaum <kyle@datadog.com>
Kyle Shannon <kyle@pobox.com>
Kyle Spiers <eiais@google.com>
Kyle Wood <kyle@kylewood.cc>
Kyohei Kadota <lufia@lufia.org>
Krylo Silin <silin@krylo.org>
L Campbell <unpantsu@gmail.com>
Lai Jiangshan <eag0628@gmail.com>
Lajos Papp <lalyos@yahoo.com>
Lakshay Garg <lakshay.garg.1996@gmail.com>
Lann Martin <lanm@google.com>
Lanre Adelowo <yo@lanre.wtf>
Larry Clapp <larry@theclapp.org>
Larry Hosken <lahosken@golang.org>
Lars Jeppesen <jeppesen.lars@gmail.com>
Lars Lehtonen <lars.lehtonen@gmail.com>
Lars Wiegman <lars@namsral.com>
Larz Conwell <larzconwell@gmail.com>
Laurent Voisin <lpvoisin@gmail.com>
Laurie Clark-Michalek <laurie@qubit.com>
LE Manh Cuong <cuong.manhle.vn@gmail.com>
Lee Hinman <hinman@gmail.com>
Lee Packham <lpackham@gmail.com>
Lehner Florian <dev@der-flo.net>
Leigh McCulloch <leighmcc@gmail.com>
Leo Antunes <leo@costela.net>
Leo Rudberg <ljr@google.com>
Leon Klingele <git@leonklingele.de>
Leonardo Comelli <leonardo.comelli@gmail.com>
Leonel Quinteros <leonel.quinteros@gmail.com>
Lev Shamardin <shamardin@gmail.com>
Lewin Bormann <lewin.bormann@gmail.com>
Liam Haworth <liam@haworth.id.au>
Lily Chung <lilithkchung@gmail.com>

Lion Yang <lion@aosc.xyz>
Liz Rice <liz@lizrice.com>
Lloyd Dewolf <foolswisdom@gmail.com>
Lorenz Bauer <lmb@cloudflare.com>
Lorenz Brun <lorenz@brun.one>
Lorenz Nickel <mail@lorenznickel.de>
Lorenzo Masini <rugginoso@develer.com>
Lorenzo Stoakes <lstoakes@gmail.com>
Louis Kruger <louisk@google.com>
Luan Santos <cfcluan@gmail.com>
Lubomir I. Ivanov <neolit123@gmail.com>
Luca Bruno <luca.bruno@coreos.com>
Luca Greco <luca.greco@alcacoop.it>
Lucas Bremgartner <lucas.bremgartner@gmail.com>
Lucas Clemente <lclemente@google.com>
Lucien Stuker <lucien.stuker@gmail.com>
Lucio De Re <lucio.dere@gmail.com>
Ludi Rehak <ludi317@gmail.com>
Luigi Riefolo <luigi.riefolo@gmail.com>
Luit van Drongelen <luitvd@gmail.com>
Luka Zakrajek <tr00.g33k@gmail.com>
Luka Zitnik <luka.zitnik@gmail.com>
Lukasz Milewski <lmmilewski@gmail.com>
Luke Champine <luke.champine@gmail.com>
Luke Curley <qpingu@gmail.com>
Luke Granger-Brown <git@lukegb.com>
Luke Young <bored-engineer@users.noreply.github.com>
Luna Duclos <luna.duclos@palmstonegames.com>
Luuk van Dijk <lvd@golang.org> <lvd@google.com>
Lyle Franklin <lylejfranklin@gmail.com>
Lynn Boger <laboger@linux.vnet.ibm.com>
Ma Peiqi <mapeiqi2017@gmail.com>
Maarten Bezemer <maarten.bezemer@gmail.com>
Maciej Dbski <maciejd@google.com>
Madhu Rajanna <madhupr007@gmail.com>
Magnus Hiie <magnus.hiie@gmail.com>
Maicon Costa <maiconscosta@gmail.com>
Mak Kolybabi <mak@kolybabi.com>
Maksym Trykur <maksym.trykur@gmail.com>
Mal Curtis <mal@mal.co.nz>
Manfred Touron <m@42.am>
Manigandan Dharmalingam <manigandan.jeff@gmail.com>
Manish Goregaokar <manishsmail@gmail.com>
Manoj Dayaram <platform-dev@moovweb.com> <manoj.dayaram@moovweb.com>
Mansour Rahimi <rahimi.mnr@gmail.com>
Manu Garg <manugarg@google.com>
Manu S Ajith <neo@codingarena.in>
Manuel Mendez <mmendez534@gmail.com>

Marat Khabibullin <marat.khabibullin@jetbrains.com>
Marc Sanmiquel <marcsanmiquel@gmail.com>
Marc Weistroff <marc@weistroff.net>
Marc-Antoine Ruel <maruel@chromium.org>
Marcel Edmund Franke <marcel.edmund.franke@gmail.com>
Marcel van Lohuizen <mpvl@golang.org>
Marcelo Cantos <marcelo.cantos@gmail.com>
Marcelo E. Magallon <marcelo.magallon@gmail.com>
Marco Hennings <marco.hennings@freiheit.com>
Marcus Weiner <marcus.weiner@gmail.com>
Marcus Willock <crazcalm@gmail.com>
Marga Manterola <marga@google.com>
Mariano Cano <mariano@smallstep.com>
Marin Bai <marin.basic02@gmail.com>
Mario Arranz <marioarranzr@gmail.com>
Marius A. Eriksen <marius@grailbio.com>
Marius Nuennerich <mnu@google.com>
Mark Adams <mark@markadams.me>
Mark Bucciarelli <mkbucc@gmail.com>
Mark Glines <mark@glines.org>
Mark Harrison <marhar@google.com>
Mark Percival <m@mdp.im>
Mark Pulford <mark@kyne.com.au>
Mark Rushakoff <mark.rushakoff@gmail.com>
Mark Ryan <mark.d.ryan@intel.com>
Mark Severson <miquella@gmail.com>
Mark Theunissen <mark.theunissen@gmail.com>
Mark Villacampa <m@markvillacampa.com>
Mark Wolfe <mark@wolfe.id.au>
Mark Zavislak <zavislak@google.com>
Marko Juhani Silokunnas <marko.silokunnas@gmail.com>
Marko Kevac <marko@kevac.org>
Marko Kungla <marko.kungla@gmail.com>
Marko Mikulicic <mkm@google.com>
Marko Mudrinic <mudrinic.mare@gmail.com>
Marko Tiikkaja <marko@joh.to>
Markus Duft <markus.duft@salomon.at>
Markus Sonderegger <marraison@gmail.com>
Markus Zimmermann <zimmski@gmail.com>
Marten Seemann <martenseemann@gmail.com>
Martin Asquino <martin.asquino@gmail.com>
Martin Bertschler <mbertschler@gmail.com>
Martin Garton <garton@gmail.com>
Martin Habbecke <marhab@google.com>
Martin Hamrle <martin.hamrle@gmail.com>
Martin Hoefling <martin.hoefling@gmx.de>
Martin Kreichgauer <martinkr@google.com>
Martin Kunc <martinkunc@users.noreply.github.com>

Martin Lindhe <martin.j.lindhe@gmail.com>
Martin Mohrmann <moehrmann@google.com> <martisch@uos.de>
Martin Neubauer <m.ne@gmx.net>
Martin Olsen <github.com@martinolsen.net>
Martin Olsson <martin@minimum.se>
Martin Probst <martin@probst.io>
Martin Sucha <anty.sk+git@gmail.com>
Martin Tournoij <martin@arp242.net>
Martins Sipenko <martins.sipenko@gmail.com>
Martynas Budrinas <mabu@google.com>
Marvin Stenger <marvin.stenger94@gmail.com>
Marwan Sulaiman <marwan.sulaiman@work.co>
Maryan Hratson <gmarik@gmail.com>
Masahiro Furudate <masahiro.furudate@gmail.com>
Masahiro Wakame <vvakame@gmail.com>
Masaki Yoshida <yoshida.masaki@gmail.com>
Masaya Watanabe <sfbgwm30@gmail.com>
Mat Byczkowski <mbyczkowski@gmail.com>
Mat Ryer <thatmatryer@gmail.com>
Mt Gulys <mgulyas86@gmail.com>
Matej Bao <matejbaco@gmail.com>
Mateus Amin <mateus.amin@gmail.com>
Mateusz Czapliski <czapkofan@gmail.com>
Mathias Beke <git@denbeke.be>
Mathias Hall-Andersen <mathias@hall-andersen.dk>
Mathias Leppich <mleppich@muhqu.de>
Mathieu Lonjaret <mathieu.lonjaret@gmail.com>
Mats Lidell <mats.lidell@cag.se> <mats.lidell@gmail.com>
Matt Aimonetti <mattaimonetti@gmail.com>
Matt Blair <me@matthewblair.net>
Matt Bostock <matt@mattbostock.com>
Matt Brown <mdbrown@google.com>
Matt Dee <mdee@hioscar.com>
Matt Drollette <matt@drollette.com>
Matt Harden <matt.harden@gmail.com>
Matt Jibson <matt.jibson@gmail.com>
Matt Joiner <anacrolix@gmail.com>
Matt Jones <mrjones@google.com>
Matt Juran <thepciet@gmail.com>
Matt Layher <mdllyher@gmail.com>
Matt Reiferson <mreiferson@gmail.com>
Matt Robenolt <matt@ydekproductions.com>
Matt Strong <mstrong1341@gmail.com>
Matt T. Proud <matt.proud@gmail.com>
Matt Williams <gh@mattyw.net> <mattyjwilliams@gmail.com>
Matthew Brennan <matty.brennan@gmail.com>
Matthew Broberg <matthewbbroberg@gmail.com>
Matthew Cottingham <mattcottingham@gmail.com>

Matthew Dempsky <mdempsky@google.com>
Matthew Denton <mdenton@skyportsystems.com>
Matthew Holt <Matthew.Holt+git@gmail.com>
Matthew Horsnell <matthew.horsnell@gmail.com>
Matthew Waters <mwwaters@gmail.com>
Mathieu Hauglustaine <matt.hauglustaine@gmail.com>
Mathieu Olivier <olivier.matthieu@gmail.com>
Matthijs Kooijman <matthijs@stdin.nl>
Max Riveiro <kavu13@gmail.com>
Max Schmitt <max@schmitt.mx>
Max Semenik <maxsem.wiki@gmail.com>
Max Ushakov <ushmax@gmail.com>
Maxim Eryomenko <moeryomenko@gmail.com>
Maxim Khitrov <max@mxcrypt.com>
Maxim Pimenov <mpimenov@google.com>
Maxim Pugachev <pugachev.mm@gmail.com>
Maxim Ushakov <ushakov@google.com>
Maxime de Roucy <maxime.deroucy@gmail.com>
Mximo Cuadros Ortiz <mcuadros@gmail.com>
Maxwell Krohn <themax@gmail.com>
Maya Rashish <maya@NetBSD.org>
Mayank Kumar <krmayankk@gmail.com>
Meir Fischer <meirfischer@gmail.com>
Meng Zhuo <mengzhuo1203@gmail.com> <mzh@golangcn.org>
Mhd Sulhan <m.shulhan@gmail.com>
Micah Stetson <micah.stetson@gmail.com>
Michael Anthony Knyszek <mknyszek@google.com>
Michael Brandenburg <mbrandenburg@bolste.com>
Michael Chaten <mchaten@gmail.com>
Michael Cook <code@mdcook.net>
Michael Darakananda <pongad@google.com>
Michael Dorner <mail@michaeldorf.de>
Michael Edwards <medwards@walledcity.ca>
Michael Elkins <michael.elkins@gmail.com>
Michael Ellis <micellis@justin.tv>
Michael Fraenkel <michael.fraenkel@gmail.com>
Michael Fromberger <michael.j.fromberger@gmail.com>
Michael Gehring <mg@ebfe.org> <gnirheg.leahcim@gmail.com>
Michael Henderson <mdhender@users.noreply.github.com>
Michael Hendricks <michael@ndrix.org>
Michael Hoisie <hoisie@gmail.com>
Michael Hudson-Doyle <michael.hudson@linaro.org>
Michael Kasch <michael.kasch@gmail.com>
Michael Kufel <golang@c.michael-kaeufl.de>
Michael Kelly <mjk@google.com>
Michael Lewis <mikelikespie@gmail.com>
Michael MacInnis <Michael.P.MacInnis@gmail.com>
Michael Marineau <michael.marineau@coreos.com>

Michael Matloob <matloob@google.com>
Michael McConville <momconville@gmail.com>
Michael McGreevy <mcgreevy@golang.org>
Michael McLoughlin <mmcloughlin@gmail.com>
Michael Munday <mike.munday@ibm.com>
Michael Pearson <mipearson@gmail.com>
Michael Piatek <piatek@google.com>
Michael Pratt <mpratt@google.com>
Michael Schaller <michael@5challer.de>
Michael Schurter <michael.schurter@gmail.com>
Michael Shields <mshields@google.com>
Michael Stapelberg <michael@stapelberg.de> <mstplbrg@googlemail.com>
Michael Steinert <mike.steinert@gmail.com>
Michael T. Jones <mtj@google.com> <michael.jones@gmail.com>
Michael Teichgrber <mteichgraeber@gmx.de> <mt4swm@googlemail.com>
Michael Traver <mtraver@google.com>
Michael Vetter <g.bluehut@gmail.com>
Michael Vogt <mvo@ubuntu.com>
Michal Bohuslvek <mbohuslvek@gmail.com>
Michal Cierniak <cierniak@google.com>
Micha Derkacz <ziutek@inet.pl>
Michal Franc <lam.michal.franc@gmail.com>
Micha owicki <mlowicki@gmail.com>
Michal Pristas <michal.pristas@gmail.com>
Michal Rostecki <mrostecki@suse.de>
Michalis Kargakis <michaliskargakis@gmail.com>
Michel Lespinasse <>walken@google.com>
Mickael Kerjean <mickael.kerjean@gmail.com>
Mickey Reiss <mickeyreiss@gmail.com>
Miek Gieben <miek@miek.nl> <remigius.gieben@gmail.com>
Miguel Acero <acero@google.com>
Miguel Mendez <stxmendez@gmail.com>
Miguel Molina <hi@mvader.me>
Mihai Borobocea <MihaiBorobocea@gmail.com>
Mihai Moldovan <ionic@ionic.de>
Mihai Todor <todormihai@gmail.com>
Mihail Minaev <minaev.mike@gmail.com>
Mikael Tillenius <mikti42@gmail.com>
Mike Andrews <mra@xoba.com>
Mike Appleby <mike@app.leby.org>
Mike Danese <mikedanese@google.com>
Mike Houston <mike@kothar.net>
Mike Kabischev <kabischev@gmail.com>
Mike Rosset <mike.rosset@gmail.com>
Mike Samuel <mikesamuel@gmail.com>
Mike Solomon <msolo@gmail.com>
Mike Strosaker <strosake@us.ibm.com>
Mike Tsao <mike@sowbug.com>

Mike Wiacek <mjwiacek@google.com>
Mikhail Fesenko <progga@gmail.com>
Mikhail Gusarov <dottedmag@dottedmag.net>
Mikhail Panchenko <m@mihasya.com>
Miki Tebeka <miki.tebeka@gmail.com>
Mikio Hara <mikioh.mikioh@gmail.com>
Mikkel Krautz <mikkel@krautz.dk> <krautz@gmail.com>
Mikoaj Baranowski <mikolajb@gmail.com>
Milan Knezevic <milan.knezevic@mips.com>
Milan Patel <bicelot3@gmail.com>
Milutin Jovanovic <jovanovic.milutin@gmail.com>
MinJae Kwon <mingrammer@gmail.com>
Miquel Sabat Sol <mikisabate@gmail.com>
Mirko Hansen <baaazen@gmail.com>
Miroslav Genov <mgenov@gmail.com>
Misty De Meo <mistydemeo@gmail.com>
Mohit Agarwal <mohit@sdf.org>
Mohit kumar Bajoria <mohitbajo36@gmail.com>
Mohit Verma <vmohit.93@gmail.com>
Momchil Velikov <momchil.velikov@gmail.com>
Monis Khan <mkhan@redhat.com>
Monty Taylor <mordred@inaugust.com>
Moritz Fain <moritz@fain.io>
Moriyoshi Koizumi <mozo@mozo.jp>
Morten Siebuhr <sbhr@sbhr.dk>
Mshe van der Sterre <moshevds@gmail.com>
Mostyn Bramley-Moore <mostyn@antipode.se>
Mrunal Patel <mrunalp@gmail.com>
Muhammad Falak R Wani <falakreyaz@gmail.com>
Muhammed Uluyol <uluyol0@gmail.com>
Muir Manders <muir@mnd.rs>
Mukesh Sharma <sharma.mukesh439@gmail.com>
Mura Li <mura_li@castech.com.tw>
Mykhailo Lesyk <mikhail@lesyk.org>
Naman Aggarwal <aggarwal.nam@gmail.com>
Nan Deng <monnand@gmail.com>
Nao Yonashiro <owan.orisano@gmail.com>
Naoki Kanatani <k12naoki@gmail.com>
Nate Wilkinson <nathanwilk7@gmail.com>
Nathan Cantelmo <n.cantelmo@gmail.com>
Nathan Caza <mastercactus@gmail.com>
Nathan Dias <nathan.dias@orijtech.com>
Nathan Fiscaletti <nathan.fiscaletti@vrzo.com>
Nathan Humphreys <nkhumphreys@gmail.com>
Nathan John Youngman <nj@nathany.com>
Nathan Otterness <otterness@cs.unc.edu>
Nathan P Finch <nate.finch@gmail.com>
Nathan VanBenschoten <nvanbenschoten@gmail.com>

Nathan Youngman <git@nathany.com>
Nathan(yinian) Hu <nathanhu@google.com>
Nathaniel Cook <nvcook42@gmail.com>
Naveen Kumar Sangi <naveenkumarsangi@protonmail.com>
Neeilan Selvalingam <neeilan96@gmail.com>
Neelesh Chandola <neelesh.c98@gmail.com>
Neil Lyons <nwjlyons@googlemail.com>
Neuman Vong <neuman.vong@gmail.com>
Neven Sajko <nsajko@gmail.com>
Nevins Bartolomeo <nevins.bartolomeo@gmail.com>
Niall Sheridan <nsheridan@gmail.com>
Nic Day <nic.day@me.com>
Nicholas Katsaros <nick@nickkatsaros.com>
Nicholas Maniscalco <nicholas@maniscalco.com>
Nicholas Ng <nickng@nickng.io>
Nicholas Presta <nick@nickpresta.ca> <nick1presta@gmail.com>
Nicholas Sullivan <nicholas.sullivan@gmail.com>
Nicholas Waples <nwaples@gmail.com>
Nick Anthony <Liberatys@outlook.com>
Nick Cooper <nmvc@google.com>
Nick Craig-Wood <nick@craig-wood.com> <nickcw@gmail.com>
Nick Harper <nharper@google.com>
Nick Kubala <nkubala@google.com>
Nick Leli <nicholasleli@gmail.com>
Nick Miyake <nmiyake@users.noreply.github.com>
Nick Patavalis <nick.patavalis@gmail.com>
Nick Petroni <npetroni@cs.umd.edu>
Nick Robinson <nrobinson13@gmail.com>
Nick Smolin <nick27surgut@gmail.com>
Nicolas BRULEZ <n.brulez@gmail.com>
Nicolas Kaiser <nikai@nikai.net>
Nicolas Owens <mischief@offblast.org>
Nicolas S. Dade <nic.dade@gmail.com>
Niek Sanders <niek.sanders@gmail.com>
Niels Widger <niels.widger@gmail.com>
Nigel Kerr <nigel.kerr@gmail.com>
Nigel Tao <nigeltao@golang.org>
Nik Nyby <nnyby@columbia.edu>
Nikhil Benesch <nikhil.benesch@gmail.com>
Nikita Gillmann <nikita@n0.is> <ng0@n0.is>
Nikita Kryuchkov <nkryuchkov10@gmail.com>
Nikita Vanyasin <nikita.vanyasin@gmail.com>
Niklas Schnelle <niklas.schnelle@gmail.com>
Niko Dziemba <niko@dziemba.com>
Nikolay Turpitko <nikolay@turpitko.com>
Nikson Kanti Paul <nikson.sust@gmail.com>
Nils Larsgrd <nilsmagnus@gmail.com>
Nir Soffer <nirsof@gmail.com>

Niranjan Godbole <niranjan8192@gmail.com>
Nishanth Shanmugham <nishanth.gerrard@gmail.com>
Noah Campbell <noahcampbell@gmail.com>
Noah Goldman <noahg34@gmail.com>
Noble Johnson <noblepoly@gmail.com>
Nodir Turakulov <nodir@google.com>
Noel Georgi <git@frezbo.com>
Norberto Lopes <nlopes.ml@gmail.com>
Norman B. Lancaster <qbradq@gmail.com>
Nuno Cruces <ncruces@users.noreply.github.com>
Obeyda Djefal <djefobey@gmail.com>
Odin Ugedal <odin@ugedal.com>
Oleg Bulatov <dmage@yandex-team.ru>
Oleg Vakheta <helginet@gmail.com>
Oleku Konko <oleku.konko@gmail.com>
Oling Cat <olingcat@gmail.com>
Oliver Hookins <ohookins@gmail.com>
Oliver Powell <oliverpowell84@gmail.com>
Oliver Stenbom <ostenbom@pivotal.io>
Oliver Tonnhofer <olt@bogosoftware.com>
Olivier Antoine <olivier.antoine@gmail.com>
Olivier Duperray <duperray.olivier@gmail.com>
Olivier Poitrey <rs@dailymotion.com>
Olivier Saingre <osaingre@gmail.com>
Omar Jarjur <ojarjur@google.com>
Oryan Moshe <iamoryanmoshe@gmail.com>
Osamu TONOMORI <osamingo@gmail.com>
zgr Kesim <oec-go@kesim.org>
Pablo Caderno <kaderno@gmail.com>
Pablo Lalloni <plalloni@gmail.com>
Pablo Rozas Larraondo <pablo.larraondo@anu.edu.au>
Pablo Santiago Blum de Aguiar <scorpus@gmail.com>
Padraig Kitterick <padraigkitterick@gmail.com>
Pallat Anchaleechamaikorn <yod.pallat@gmail.com>
Panos Georgiadis <pgeorgiadis@suse.de>
Pantelis Sampaziotis <psampaz@gmail.com>
Paolo Giarrusso <p.giarrusso@gmail.com>
Paolo Martini <mrtnpaolo@gmail.com>
Parker Moore <parkrmoore@gmail.com>
Parminder Singh <parmsingh101@gmail.com>
Pascal Dierich <pascal@pascaldierich.com>
Pascal S. de Kloe <pascal@quies.net>
Paschalis Tsilias <paschalis.tsilias@gmail.com>
Pasi Thkp <pasi.tahkapaa@gmail.com>
Pat Moroney <pat@pat.email>
Patrick Barker <barkerp@vmware.com>
Patrick Crosby <patrick@stathat.com>
Patrick Gavlin <pgavlin@gmail.com>

Patrick Higgins <patrick.allen.higgins@gmail.com>
Patrick Lee <pattyshack101@gmail.com>
Patrick Mzard <patrick@mezard.eu>
Patrick Mylund Nielsen <patrick@patrickmn.com>
Patrick Pelletier <pp.pelletier@gmail.com>
Patrick Riley <pfr@google.com>
Patrick Smith <pat42smith@gmail.com>
Patrik Lundin <patrik@sigterm.se>
Paul A Querna <paul.querna@gmail.com>
Paul Borman <borman@google.com>
Paul Boyd <boyd.paul2@gmail.com>
Paul Chang <paulchang@google.com>
Paul D. Weber <x0bdev@gmail.com>
Paul Hammond <paul@paulhammond.org>
Paul Hankin <paulhankin@google.com>
Paul Jolly <paul@myitcv.org.uk>
Paul Lalonde <paul.a.lalonde@gmail.com>
Paul M Furley <paul@paulfurley.com>
Paul Marks <pmarks@google.com>
Paul Meyer <paul.meyer@microsoft.com>
Paul Nasrat <pnasrat@google.com>
Paul PISCUC <paul.piscuc@gmail.com>
Paul Querna <pquerna@apache.org>
Paul Rosania <paul.rosania@gmail.com>
Paul Ruest <pruest@gmail.com>
Paul Sbarra <Sbarra.Paul@gmail.com>
Paul Smith <paulsmith@pobox.com> <paulsmith@gmail.com>
Paul Tyng <paul@paultyng.net>
Paul van Brouwershaven <paul@vanbrouwershaven.com>
Paul Wankadia <junyer@google.com>
Paulo Casaretto <pcasaretto@gmail.com>
Paulo Flabiano Smorigo <pfsmorigo@linux.vnet.ibm.com>
Paulo Gomes <paulo.gomes.uk@gmail.com>
Pavel Paulau <pavel.paulau@gmail.com>
Pavel Zinovkin <pavel.zinovkin@gmail.com>
Pavlo Sumkin <ymkins@gmail.com>
Pawel Knap <pawelknap88@gmail.com>
Pawel Szczur <filemon@google.com>
Pei Xian Chee <luciolas1991@gmail.com>
Percy Wegmann <ox.to.a.cart@gmail.com>
Perry Abbott <perry.j.abbott@gmail.com>
Petar Dambovaliev <petar.atanasov.1987@gmail.com>
Petar Maymoukov <petarm@gmail.com>
Peter Armitage <peter.armitage@gmail.com>
Peter Bourgon <peter@bourgon.org>
Peter Collingbourne <pcc@google.com>
Peter Conerly <pconerly@gmail.com>
Peter Dotchev <dotchev@gmail.com>

Peter Froehlich <peter.hans.froehlich@gmail.com>
Peter Gonda <pgonda@google.com>
Peter Hoyes <pahoyes@gmail.com>
Peter Kleiweg <pkleiweg@xs4all.nl>
Peter McKenzie <petermck@google.com>
Peter Moody <pmoody@uber.com>
Peter Morjan <pmorjan@gmail.com>
Peter Mundy <go.peter.90@gmail.com>
Peter Nguyen <peter@mictis.com>
Pter Surnyi <speter.go1@gmail.com>
Pter Szab <pts@google.com>
Pter Szilgyi <peterke@gmail.com>
Peter Teichman <pteichman@fastly.com>
Peter Tseng <ptseng@squareup.com>
Peter Waldschmidt <peter@waldschmidt.com>
Peter Waller <peter.waller@gmail.com>
Peter Weinberger <pjw@golang.org>
Peter Williams <pwil3058@gmail.com>
Peter Wu <pwu@cloudflare.com>
Peter Zhang <i@ddatsh.com>
Petr Jedin <petr.jediny@gmail.com>
Petrica Voicu <pvoicu@paypal.com>
Phil Pearl <philip.j.r.pearl@gmail.com>
Phil Pennock <pdp@golang.org>
Philip Brgesen <philip.brgesen@gmail.com>
Philip Brown <phil@bolthole.com>
Philip Hofer <phofer@umich.edu>
Philip K. Warren <pkwarren@gmail.com>
Philip Nelson <me@pnelson.ca>
Philipp Stephani <phst@google.com>
Pierre Carru <pierre.carru@eshard.com>
Pierre Durand <pierredurand@gmail.com>
Pierre Prinetti <pierreprinetti@gmail.com>
Pierre Roullon <pierre.roullon@gmail.com>
Piers <google@hellopiers.pro>
Pieter Droogendijk <pieter@binky.org.uk>
Pietro Gagliardi <pietro10@mac.com>
Piyush Mishra <piyush@codeitout.com>
Plekhanov Maxim <kishtatix@gmail.com>
Polina Osadcha <polliosa@google.com>
Pontus Leitzler <leitzler@gmail.com>
Povilas Versockas <p.versockas@gmail.com>
Prasanga Siripala <pj@pjebs.com.au>
Prasanna Swaminathan <prasanna@mediamath.com>
Prashant Agrawal <prashant.a.vjti@gmail.com>
Prashant Varanasi <prashant@prashantv.com>
Praveen Kumar <praveen+git@kumar.in>
Pravendra Singh <hackpravj@gmail.com>

Preetam Jinka <pj@preet.am>
Pure White <wu.purewhite@gmail.com>
Qais Patankar <qaisjp@gmail.com>
Qiuxuan Zhu <ilsh1022@gmail.com>
Quan Tran <qeed.quan@gmail.com>
Quan Yong Zhai <qyzhai@gmail.com>
Quentin Perez <qperez@ocs.online.net>
Quentin Renard <contact@asticode.com>
Quentin Smith <quentin@golang.org>
Quey-Liang Kao <s101062801@m101.nthu.edu.tw>
Quinn Slack <sq@sourcegraph.com>
Quinten Yearsley <qyearsley@chromium.org>
Quoc-Viet Nguyen <afelion@gmail.com>
Radek Sohlich <sohlich@gmail.com>
Radu Berinde <radu@cockroachlabs.com>
Rafal Jeczalik <rjeczalik@gmail.com>
Raghavendra Nagaraj <jamdagni86@gmail.com>
Rahul Chaudhry <rahulchaudhry@chromium.org>
Raif S. Naffah <go@naffah-raif.name>
Rajat Goel <rajat.goel2010@gmail.com>
Rajath Agasthya <rajathagasthya@gmail.com>
Rajender Reddy Kompally <rajenderreddykompally@gmail.com>
Ralph Corderoy <ralph@inputplus.co.uk>
Ramazan AYYILDIZ <rayyildiz@gmail.com>
Ramesh Dharan <dharan@google.com>
Raph Levien <raph@google.com>
Raphael Geronimi <raphael.geronimi@gmail.com>
Raul Silvera <rsilvera@google.com>
Ravil Bikbulatov <weeellz12@gmail.com>
RaviTeja Pothana <ravi.tezu@gmail.com>
Ray Tung <rtung@thoughtworks.com>
Raymond Kazlauskas <raima220@gmail.com>
Rebecca Stambler <rstambler@golang.org>
Reilly Watson <reillywatson@gmail.com>
Reinaldo de Souza Jr <juniorz@gmail.com>
Remi Gillig <remigillig@gmail.com>
Rmy Oudompheng <oudomphe@phare.normalesup.org> <remyoudompheng@gmail.com>
Ren Ogaki <re.yuz77777@gmail.com>
Rens Rikkerink <Ikkerens@users.noreply.github.com>
Rhys Hiltner <rhys@justin.tv>
Ricardo Padilha <ricardospadilha@gmail.com>
Ricardo Seriani <ricardo.seriani@gmail.com>
Richard Barnes <rlb@ipv.sx>
Richard Crowley <r@rcrowley.org>
Richard Dingwall <rdingwall@gmail.com>
Richard Eric Gavaletz <gavaletz@gmail.com>
Richard Gibson <richard.gibson@gmail.com>
Richard Miller <miller.research@gmail.com>

Richard Musiol <mail@richard-musiol.de> <neelance@gmail.com>
Richard Ulmer <codesoap@mailbox.org>
Richard Wilkes <wilkes@me.com>
Rick Arnold <rickarnoldjr@gmail.com>
Rick Hudson <rlh@golang.org>
Rick Sayre <whorfin@gmail.com>
Rijnard van Tonder <rvantonder@gmail.com>
Riku Voipio <riku.voipio@linaro.org>
Risto Jaakko Saareln <rsaareln@gmail.com>
Rob Earhart <earhart@google.com>
Rob Findley <rfindley@google.com>
Rob Norman <rob.norman@infinitycloud.com>
Rob Phoenix <rob@robphoenix.com>
Rob Pike <r@golang.org>
Robert Ayrapetyan <robert.ayrapetyan@gmail.com>
Robert Daniel Kortschak <dan.kortschak@adelaide.edu.au> <dan@kortschak.io>
Robert Dinu <r@varp.se>
Robert Figueiredo <robfig@gmail.com>
Robert Griesemer <gri@golang.org>
Robert Hencke <robert.hencke@gmail.com>
Robert Iannucci <iannucci@google.com>
Robert Kuska <rkuska@gmail.com>
Robert Obryk <robryk@gmail.com>
Robert Seseek <rseseek@google.com>
Robert Snedegar <roberts@google.com>
Robert Stepanek <robert.stepanek@gmail.com>
Robert van Gent <rvangent@google.com>
Robert-Andr Mauchin <zebob.m@gmail.com>
Roberto Clapis <robclap8@gmail.com>
Roberto Selbach <roberto@selbach.ca>
Robin Eklind <r.eklind.87@gmail.com>
Robin Zhong <robin@robinzhong.co>
Rodolfo Carvalho <rhcavalho@gmail.com>
Rodolfo Rodriguez <rodolfobgibson@gmail.com>
Rodrigo Moraes de Oliveira <rodrigo.moraes@gmail.com>
Rodrigo Rafael Monti Kochenburger <divoxx@gmail.com>
Roger Pau Monn <royger@gmail.com>
Roger Peppe <rogpeppe@gmail.com>
Rohan Challa <rohan@golang.org>
Rohan Verma <rohanverma2004@gmail.com>
Rohith Ravi <entombedvirus@gmail.com>
Roland Illig <roland.illig@gmx.de>
Roland Shoemaker <rolandshoemaker@gmail.com>
Romain Bague <romain.bague@elwinar.com>
Roman Budnikov <romanyx90@yandex.ru>
Roman Kollr <roman.kollar.0@gmail.com>
Roman Shchekin <mrqtros@gmail.com>
Ron Hashimoto <mail@h2so5.net>

Ron Minnich <rminnich@gmail.com>
Ross Chater <rdchater@gmail.com>
Ross Kinsey <rossikinsey@gmail.com>
Ross Light <light@google.com> <rlight2@gmail.com>
Ross Smith II <ross@smithii.com>
Rowan Marshall <rowanajmarshall@gmail.com>
Rowan Worth <sqweek@gmail.com>
Rudi Kramer <rudi.kramer@gmail.com>
Rui Ueyama <ruiu@google.com>
Ruixin Bao <ruixin.bao@ibm.com>
Ruslan Nigmatullin <elessar@dropbox.com>
Russ Cox <rsc@golang.org>
Russell Haering <russellhaering@gmail.com>
Ryan Bagwell <ryanbagwell@outlook.com>
Ryan Barrett <ryanb@google.com>
Ryan Boehning <ryan.boehning@apcera.com>
Ryan Brown <ribrdb@google.com>
Ryan Canty <jrcanty@gmail.com>
Ryan Dahl <ry@tinyclouds.org>
Ryan Hitchman <hitchmanr@gmail.com>
Ryan Lower <rpjlower@gmail.com>
Ryan Roden-Corrent <ryan@rcorre.net>
Ryan Seys <ryan@ryanseys.com>
Ryan Slade <ryanslade@gmail.com>
Ryan Zhang <ryan.zhang@docker.com>
Ryoichi KATO <ryo1kato@gmail.com>
Ryuji Iwata <qt.luigi@gmail.com>
Ryuma Yoshida <ryuma.y1117@gmail.com>
Ryuzo Yamamoto <ryuzo.yamamoto@gmail.com>
S.alar Onur <caglar@10ur.org>
Sabin Mihai Rapan <sabin.rapan@gmail.com>
Sad Pencil <qh06@qq.com>
Sai Cheemalapati <saicheems@google.com>
Takeven Jiang <jc5930@sina.cn>
Salmon Aljammz <s@0x65.net>
Sam Arnold <sarnold64@bloomberg.net>
Sam Boyer <tech@samboyer.org>
Sam Chen <chenxsan@gmail.com>
Sam Cross <samgcdev@gmail.com>
Sam Ding <samding@ca.ibm.com>
Sam Hug <samuel.b.hug@gmail.com>
Sam Thorogood <thorogood@google.com> <sam.thorogood@gmail.com>
Sam Whited <sam@samwhited.com>
Sameer Ajmani <sameer@golang.org> <ajmani@gmail.com>
Sami Commerot <samic@google.com>
Sami Pnknen <sami.ponkanen@gmail.com>
Samuel Kelemen <SCKelemen@users.noreply.github.com>
Samuel Tan <samueltan@google.com>

Samuele Pedroni <pedronis@lucediaruna.net>
Sander van Harmelen <sander@vanharmelen.nl>
Sanjay Menakuru <balasanjay@gmail.com>
Santhosh Kumar Tekuri <santhosh.tekuri@gmail.com>
Sarah Adams <shadams@google.com>
Sardorbek Pulatov <sardorbek.pulatov@outlook.com>
Sascha Brawer <sascha@brawer.ch>
Sasha Lionheart <lionhearts@google.com>
Sasha Sobol <sasha@scaledinference.com>
Scott Barron <scott.barron@github.com>
Scott Bell <scott@sctsm.com>
Scott Crunkleton <crunk1@gmail.com>
Scott Ferguson <scottwferg@gmail.com>
Scott Lawrence <bytbody@gmail.com>
Scott Mansfield <smansfield@netflix.com>
Scott Ragan <ragansa@fb.com>
Scott Schwartz <scotts@golang.org>
Scott Van Woudenberg <scottvw@google.com>
Sean Burford <sburford@google.com>
Sean Chen <oohcode@gmail.com>
Sean Chittenden <seanc@joyent.com>
Sean Christopherson <sean.j.christopherson@intel.com>
Sean Dolphin <Sean.Dolphin@kpcompass.com>
Sean Harger <sharger@google.com>
Sean Liao <seankhliao@gmail.com>
Sean Rees <sean@erifax.org>
Sebastiaan van Stijn <github@gone.nl>
Sebastian Chlopecki <sebsebmc@gmail.com>
Sebastian Kinne <skinne@google.com>
Sebastian Schmidt <yath@google.com>
Sebastien Binet <seb.binet@gmail.com>
Sbastien Paolacci <sebastien.paolacci@gmail.com>
Sebastien Williams-Wynn <sebastien@cytora.com>
Segev Finer <segev208@gmail.com>
Seiji Takahashi <timaki.st@gmail.com>
Sergei Lemeshkin <sergeilem@gmail.com>
Sergei Skorobogatov <skorobo@rambler.ru>
Sergei Zagurskii <gvozdoder@gmail.com>
Sergey 'Snake' Gromov <snake.scaly@gmail.com>
Sergey Arseev <sergey.arseev@intel.com>
Sergey Dobrodey <sergey.dobrodey@synesis.ru>
Sergey Frolov <sfrolov@google.com>
Sergey Glushchenko <gs serge@gmail.com>
Sergey Ivanov <ser1325@gmail.com>
Sergey Lukjanov <me@slukjanov.name>
Sergey Mishin <sergeymishine@gmail.com>
Sergey Mudrik <sergey.mudrik@gmail.com>
Sergey Semin <gray12511@gmail.com>

Sergey Yanykin <syanykin@ozon.ru>
Sergio Luis O. B. Correia <sergio@correia.cc>
Sergiusz Bazanski <bazanski@gmail.com>
Serhat Giydiren <serhatgydiren@gmail.com>
Serhii Aheienko <serhii.aheienko@gmail.com>
Seth Hoenig <seth.a.hoenig@gmail.com>
Seth Vargo <sethvargo@gmail.com>
Shahar Kohanim <skohanim@gmail.com>
Shamil Garatuev <garatuev@gmail.com>
Shane Hansen <shanemhansen@gmail.com>
Shang Jian Ding <sding3@ncsu.edu>
Shaozhen Ding <dsz0111@gmail.com>
Shaquille Wyan Que <shaqywywan@gmail.com>
Shaun Dunning <shaun.dunning@uservoice.com>
Shawn Elliott <sellott@microsoft.com>
Shawn Ledbetter <sledbetter@google.com>
Shawn Smith <shawn.p.smith@gmail.com>
Shawn Walker-Salas <shawn.walker@oracle.com>
Shenghou Ma <minux@golang.org> <minux.ma@gmail.com>
Shengjing Zhu <zsj950618@gmail.com>
Shengyu Zhang <shengyu.zhang@chaitin.com>
Shi Han Ng <shihanng@gmail.com>
Shijie Hao <haormj@gmail.com>
Shinji Tanaka <shinji.tanaka@gmail.com>
Shintaro Kaneko <kaneshin0120@gmail.com>
Shivakumar GN <shivakumar.gn@gmail.com>
Shivani Singhal <shivani.singhal2804@gmail.com>
Shivansh Rai <shivansh@freebsd.org>
Shivashis Padhi <shivashispadhi@gmail.com>
Shubham Sharma <shubham.sha12@gmail.com>
Shun Fan <sfan@google.com>
Silvan Jegen <s.jegen@gmail.com>
Simarpreet Singh <simar@linux.com>
Simon Drake <simondrake1990@gmail.com>
Simon Ferquel <simon.ferquel@docker.com>
Simon Jefford <simon.jefford@gmail.com>
Simon Rawet <simon@rawet.se>
Simon Rozman <simon@rozman.si>
Simon Thulbourn <simon+github@thulbourn.com>
Simon Whitehead <chemnova@gmail.com>
Sina Siadat <siadat@gmail.com>
Sjoerd Siebinga <sjoerd.siebinga@gmail.com>
Sokolov Yura <funny.falcon@gmail.com>
Song Gao <song@gao.io>
Soojin Nam <jsunam@gmail.com>
Sren L. Hansen <soren@linux2go.dk>
Spencer Kocot <spencerkocot@gmail.com>
Spencer Nelson <s@spenczar.com>

Spencer Tung <spencertung@google.com>
Spring Mc <heresy.mc@gmail.com>
Srdjan Petrovic <spetrovic@google.com>
Sridhar Venkatakrishnan <sridhar@laddoo.net>
Srinidhi Kaushik <shrinidhi.kaushik@gmail.com>
StalkR <stalkr@stalkr.net>
Stan Schwertly <stan@schwertly.com>
Stanislav Afanasev <php.progger@gmail.com>
Steeve Morin <steeve.morin@gmail.com>
Stefan Baebler <sbaebler@outbrain.com>
Stefan Nilsson <snilsson@nada.kth.se> <trolleriprofessorn@gmail.com>
Stepan Shabalin <neverliberty@gmail.com>
Stephan Renatus <srenatus@chef.io>
Stephan Zuercher <zuercher@gmail.com>
Stphane Travostino <stephane.travostino@gmail.com>
Stephen Lewis <stephen@sock.org.uk>
Stephen Lu <steuhs@users.noreply.github.com>
Stephen Ma <stephenm@golang.org>
Stephen McQuay <stephen@mcquay.me>
Stephen Searles <stephens2424@gmail.com>
Stephen Weinberg <stephen@q5comm.com>
Steve Francia <spf@golang.org>
Steve Gilbert <stevegilbert23@gmail.com>
Steve LoFurno <slofurno@gmail.com>
Steve McCoy <mccoyst@gmail.com>
Steve Mynott <steve.mynott@gmail.com>
Steve Newman <snewman@google.com>
Steve Phillips <elimistev@gmail.com>
Steve Streeting <steve@stevestreeting.com>
Steven Buss <sbuss@google.com>
Steven Elliot Harris <seharris@gmail.com>
Steven Erenst <stevenerenst@gmail.com>
Steven Hartland <steven.hartland@multiplay.co.uk>
Steven Littiebrant <imgroxx@gmail.com>
Steven Wilkin <stevenwilkin@gmail.com>
Stuart Jansen <sjansen@buscaluz.org>
Sue Spence <virtuallysue@gmail.com>
Sugu Sougoumarane <ssougou@gmail.com>
Suharsh Sivakumar <suharshs@google.com>
Sukrit Handa <sukrit.handa@utoronto.ca>
Sunny <me@darkowlzz.space>
Suriyaa Sundararuban <suriyaasundararuban@gmail.com>
Suyash <dextrous93@gmail.com>
Suzy Mueller <suzmue@golang.org>
Sven Almgren <sven@tras.se>
Sven Blumenstein <svbl@google.com>
Sven Taute <sven.taute@gmail.com>
Sylvain Zimmer <sylvain@sylvainzimmer.com>

Syohei YOSHIDA <syohex@gmail.com>
Szabolcs Nagy <nsz@port70.net>
Taavi Kivisik <taavi.kivisik@gmail.com>
Tad Fisher <tadfisher@gmail.com>
Tad Glines <tad.glines@gmail.com>
Tadas Valiukas <tadovas@gmail.com>
Tadeo Kondrak <me@tadeo.ca>
Taesu Pyo <pyotaesu@gmail.com>
Tai Le <letientai299@gmail.com>
Taj Khattra <taj.khattra@gmail.com>
Takashi Matsuo <tmatsuo@google.com>
Takayoshi Nishida <takayoshi.nishida@gmail.com>
Takeshi YAMANASHI <9.nashi@gmail.com>
Takuto Ikuta <tikuta@google.com>
Takuya Ueda <uedatakuya@gmail.com>
Tal Shprecher <tshprecher@gmail.com>
Tams Gulcsi <tgulacsi78@gmail.com>
Tamir Duberstein <tamird@gmail.com>
Tao Qingyun <qingyunha@gmail.com>
Tao Shen <shentaoskyking@gmail.com>
Tao Wang <twang2218@gmail.com>
Tarmigan Casebolt <tarmigan@gmail.com>
Taro Aoki <aizu.s1230022@gmail.com>
Taru Karttunen <taruti@taruti.net>
Tatsuhiko Tsujikawa <tatsuhiko.t@gmail.com>
Tatsuya Kaneko <m.ddotx.f@gmail.com>
Taufiq Rahman <taufiqrx8@gmail.com>
Teague Cole <tnc1443@gmail.com>
Ted Kornish <golang@tedkornish.com>
Tejasvi Nareddy <tejunareddy@gmail.com>
Terin Stock <terinjokes@gmail.com>
Terrel Shumway <gopher@shumway.us>
Tetsuo Kiso <tetsuokiso9@gmail.com>
Than McIntosh <thanm@google.com>
Thanabodee Charoenpiriyakij <wingyminus@gmail.com>
Thanatat Tamtan <acoshift@gmail.com>
The Hatsune Daishi <nao20010128@gmail.com>
Thiago Avelino <t@avelino.xxx>
Thiago Fransosi Farina <thiago.farina@gmail.com> <tfarina@chromium.org>
Thomas Alan Copeland <talan.copeland@gmail.com>
Thomas Bonfort <thomas.bonfort@gmail.com>
Thomas Bouldin <inlined@google.com>
Thomas Bruyelle <thomas.bruyelle@gmail.com>
Thomas Bushnell, BSG <tbushnell@google.com>
Thomas de Zeeuw <thomasdezeeuw@gmail.com>
Thomas Desrosiers <thomasdesr@gmail.com>
Thomas Habets <habets@google.com>
Thomas Kappler <tkappler@gmail.com>

Thomas Meson <zllak@hycik.org>
Thomas Symborski <thomas.symborski@gmail.com>
Thomas Wanielista <tomwans@gmail.com>
Thorben Krueger <thorben.krueger@gmail.com>
Thordur Bjornsson <thorduri@secnorth.net>
Tiago Queiroz <contato@tiago.eti.br>
Tianji Wu <the729@gmail.com>
Tianon Gravi <admwiggin@gmail.com>
Tilman Dilo <tilman.dilo@gmail.com>
Tim Cooijmans <timcooijmans@gmail.com>
Tim Cooper <tim.cooper@layeh.com>
Tim Ebringer <tim.ebringer@gmail.com>
Tim Heckman <t@heckman.io>
Tim Henderson <tim.tadh@gmail.com>
Tim Hockin <thockin@google.com>
Tim Mhlmann <muhlemmer@gmail.com>
Tim Swast <swast@google.com>
Tim Wright <tenortim@gmail.com>
Tim Xu <xiaoxubeii@gmail.com>
Timmy Douglas <timmyd983@gmail.com>
Timo Savola <timo.savola@gmail.com>
Timo Truys <alkaloid.btx@gmail.com>
Timothy Studd <tim@timstudd.com>
Tipp Moseley <tipp@google.com>
Tobias Assarsson <tobias.assarsson@gmail.com>
Tobias Columbus <tobias.columbus@gmail.com> <tobias.columbus@googlemail.com>
Tobias Klauser <tklauser@distanz.ch>
Toby Burrell <kurin@google.com>
Todd Kulesza <tkulesza@google.com>
Todd Neal <todd@tneal.org>
Todd Wang <toddwang@gmail.com>
Tom Anthony <git@tomanthony.co.uk>
Tom Bergan <tombergan@google.com>
Tom Heng <zhm20070928@gmail.com>
Tom Lanyon <tomlanyon@google.com>
Tom Levy <tomlevy93@gmail.com>
Tom Limoncelli <tal@whatexit.org>
Tom Linfoord <tomlinfoord@gmail.com>
Tom Parkin <tom.parkin@gmail.com>
Tom Payne <twpayne@gmail.com>
Tom Szymanski <tgs@google.com>
Tom Thorogood <me+google@tomthorogood.co.uk>
Tom Wilkie <tom@weave.works>
Tomas Dabasinskas <tomas@dabasinskas.net>
Tommy Schaefer <tommy.schaefer@teecom.com>
Tomohiro Kusumoto <zabio1192@gmail.com>
Tomoya Ishizaki <zaq1tomo@gmail.com>
Tonis Tiigi <tonistiigi@gmail.com>

Tony Reix <tony.reix@bull.net>
Tony Walker <walkert.uk@gmail.com>
Tooru Takahashi <tooru.takahashi134@gmail.com>
Tor Andersson <tor.andersson@gmail.com>
Torben Schinke <torben.schinke@neotos.de>
Tormod Erevik Lea <tormodlea@gmail.com>
Toshihiro Shiino <shiino.toshihiro@gmail.com>
Toshiki Shima <hayabusa1419@gmail.com>
Totoro W <tw19881113@gmail.com>
Travis Bischel <travis.bischel@gmail.com>
Travis Cline <travis.cline@gmail.com>
Trevor Strohman <trevor.strohman@gmail.com>
Trey Lawrence <lawrence.trey@gmail.com>
Trey Roessig <trey.roessig@gmail.com>
Trey Tacon <ttacon@gmail.com>
Tristan Amini <tamini01@ca.ibm.com>
Tristan Colgate <tcolgate@gmail.com>
Tristan Oohry <oohry@gmail.com>
Tristan Rice <rice@fn.lc>
Troels Thomsen <troels@thomsen.io>
Trung Nguyen <trung.n.k@gmail.com>
Tsuji Daishiro <dram.dt.shonan@gmail.com>
Tudor Golubenco <tudor.g@gmail.com>
Tugdual Saunier <tugdual.saunier@gmail.com>
Tuo Shan <sturbo89@gmail.com> <shantuo@google.com>
Tyler Bui-Palsulich <tpalsulich@google.com>
Tyler Bunnell <tylerbunnell@gmail.com>
Tyler Treat <ttreat31@gmail.com>
Tyson Andre <tysonandre775@gmail.com>
Tzach Shabtay <tzachshabtay@gmail.com>
Tzu-Jung Lee <roylee17@currant.com>
Udalov Max <re.udalov@gmail.com>
Ugorji Nwoke <ugorji@gmail.com>
Ulf Holm Nielsen <doktor@dyregod.dk>
Ulrich Kunitz <uli.kunitz@gmail.com>
Umang Parmar <umangjparmar@gmail.com>
Uriel Mangado <uriel@berlinblue.org>
Urvil Patel <patelurvil38@gmail.com>
Uttam C Pawar <uttam.c.pawar@intel.com>
Vadim Grek <vadimprog@gmail.com>
Vadim Vygonets <unixdj@gmail.com>
Val Polouchkine <vpolouch@justin.tv>
Valentin Vidic <vvidic@valentin-vidic.from.hr>
Vee Zhang <veezhang@126.com> <vveezhang@gmail.com>
Vega Garcia Luis Alfonso <vegacom@gmail.com>
Venil Noronha <veniln@vmware.com>
Veselkov Konstantin <kostozyb@gmail.com>
Viacheslav Poturaev <vearutop@gmail.com>

Victor Chudnovsky <vchudnov@google.com>
Victor Vrantchan <vrancean+github@gmail.com>
Vignesh Ramachandra <vickyramachandra@gmail.com>
Vikas Kedia <vikask@google.com>
Ville Skytt <ville.skytta@iki.fi>
Vincent Ambo <tazjin@googlemail.com>
Vincent Batts <vbatts@hashbangbash.com> <vbatts@gmail.com>
Vincent Vanackere <vincent.vanackere@gmail.com>
Vinu Rajashekhar <vinutheraj@gmail.com>
Vish Subramanian <vish@google.com>
Vishvananda Ishaya <vishvananda@gmail.com>
Visweswara R <r.visweswara@gmail.com>
Vitaly Zdanevich <zdanevich.vitaly@ya.ru>
Vitor De Mario <vitordemario@gmail.com>
Vivek Sekhar <vsekhar@google.com>
Vivian Liang <vliang88@gmail.com>
Vlad Krasnov <vlad@cloudflare.com>
Vladimir Evgrafov <evgrafov.vladimir@gmail.com>
Vladimir Kovpak <cn007b@gmail.com>
Vladimir Kuzmin <vkuzmin@uber.com>
Vladimir Mihailenco <vladimir.webdev@gmail.com>
Vladimir Nikishenko <vova616@gmail.com>
Vladimir Stefanovic <vladimir.stefanovic@imgtec.com>
Vladimir Varankin <nek.narqo@gmail.com>
Vojtech Bocek <vbocek@gmail.com>
Volker Dobler <dr.volker.dobler@gmail.com>
Volodymyr Paprotski <vpaprots@ca.ibm.com>
W. Trevor King <wking@tremily.us>
Wade Simmons <wade@wades.im>
Wagner Riffel <wgriffel@gmail.com>
Walt Della <walt@javins.net>
Walter Poupore <wpoupore@google.com>
Wander Lairson Costa <wcosta@mozilla.com>
Wang Xuerui <git@xen0n.name>
Warren Fernandes <warren.f.fernandes@gmail.com>
Wayne Ashley Berry <wayneashleyberry@gmail.com>
Wedson Almeida Filho <wedsonaf@google.com>
Weerasak Chongnguluam <singpor@gmail.com>
Wi Cngru <crvv.mail@gmail.com>
Wei Fu <fhfuwei@163.com>
Wei Guangjing <vcc.163@gmail.com>
Wei Xiao <wei.xiao@arm.com>
Wei Xikai <xykwei@gmail.com>
Weichao Tang <tevic.tt@gmail.com>
Wembley G. Leach, Jr <wembley.gl@gmail.com>
Wenlei (Frank) He <wlhe@google.com>
Wenzel Lowe <lowewenzel@gmail.com>
Wil Selwood <wselwood@gmail.com>

Wilfried Teiken <wteiken@google.com>
Will Beason <willbeason@gmail.com>
Will Chan <willchan@google.com>
Will Faught <will.faught@gmail.com>
Will Morrow <wmorrow.qdt@qualcommdatacenter.com>
Will Norris <willnorris@google.com>
Will Storey <will@summercat.com>
Willem van der Schyff <willemvds@gmail.com>
William Chan <willchan@chromium.org>
William Chang <mr.williamchang@gmail.com>
William Josephson <wjosephson@gmail.com>
William Orr <will@worrbase.com> <ay1244@gmail.com>
William Poussier <william.poussier@gmail.com>
Wisdom Omuya <deafgoat@gmail.com>
Wu Yunzhou <yunzhouwu@gmail.com>
Xi Ruoyao <xry23333@gmail.com>
Xia Bin <snyh@snyh.org>
Xiangdong Ji <xiangdong.ji@arm.com>
Xing Xing <mikespook@gmail.com>
Xingqiang Bai <bxq2011hust@qq.com>
Xu Fei <badgangkiller@gmail.com>
Xudong Zhang <felixmelon@gmail.com>
Xudong Zheng <7pkvm5aw@slicealias.com>
Xuyang Kang <xuyangkang@gmail.com>
Yamagishi Kazutoshi <ykzts@desire.sh>
Yan Zou <yzou@google.com>
Yang Hau <vulxj0j8j8@gmail.com>
Yang Tian <linuxty@gmail.com>
Yann Hodique <yhodique@google.com>
Yann Kerherv <yann.kerherve@gmail.com>
Yann Salan <yannsalaun1@gmail.com>
Yannic Bonenberger <contact@yannic-bonenberger.com>
Yao Zhang <lunaria21@gmail.com>
Yaron de Leeuw <jarondl@google.com>
Yaroslav Vorobiov <yar.vorobiov@gmail.com>
Yasha Bubnov <girokompass@gmail.com>
Yasser Abdolmaleki <yasser@yasser.ca>
Yasuharu Goto <matope.ono@gmail.com>
Yasuhiro Matsumoto <mattn.jp@gmail.com>
Yasuyuki Oka <yasuyk@gmail.com>
Yazen Shunnar <yazen.shunnar@gmail.com>
Yestin Sun <ylh@pdx.edu>
Yesudeep Mangalapilly <yesudeep@google.com>
Yissakhar Z. Beck <yissakhar.beck@gmail.com>
Yo-An Lin <yoanlin93@gmail.com>
Yohei Takeda <yo.tak0812@gmail.com>
Yongjian Xu <i3dmaster@gmail.com>
Yorman Arias <cixtords@gmail.com>

Yoshiyuki Kanno <nekotaroh@gmail.com> <yoshiyuki.kanno@stoic.co.jp>
Yoshiyuki Mineo <yoshiyuki.mineo@gmail.com>
Yosuke Akatsuka <yosuke.akatsuka@gmail.com>
Yu Heng Zhang <annita.zhang@cn.ibm.com>
Yu Xuan Zhang <zyxsh@cn.ibm.com>
Yuichi Kishimoto <yk2220s@gmail.com>
Yuichi Nishiwaki <yuichi.nishiwaki@gmail.com>
Yuji Yaginuma <yuuji.yaginuma@gmail.com>
Yuki OKUSHI <huyuumi.dev@gmail.com>
Yuki Yugui Sonoda <yugui@google.com>
Yukihiro Nishinaka <6elpinal@gmail.com>
Yury Smolsky <yury@smolsky.by>
Yusuke Kagiwada <block.rxckin.beats@gmail.com>
Yuusei Kuwana <kuwana@kumama.org>
Yuval Pavel Zholkover <paulzhol@gmail.com>
Yves Junqueira <yvesj@google.com> <yves.junqueira@gmail.com>
Zac Bergquist <zbergquist99@gmail.com>
Zach Bintliff <zbinliff@gmail.com>
Zach Gershman <zachgersh@gmail.com>
Zach Jones <zachj1@gmail.com>
Zachary Amsden <zach@thundertoken.com>
Zachary Gershman <zgershman@pivotal.io>
Zak <zrjknill@gmail.com>
Zakatell Kanda <hi@zkanda.io>
Zellyn Hunter <zellyn@squareup.com> <zellyn@gmail.com>
Zev Goldstein <zev.goldstein@gmail.com>
Zhang Boyang <zhangboyang.id@gmail.com>
Zheng Dayu <davidzheng23@gmail.com>
Zheng Xu <zheng.xu@arm.com>
Zhengyu He <hzy@google.com>
Zhongpeng Lin <zplin@uber.com>
Zhongtao Chen <chenzhongtao@126.com>
Zhongwei Yao <zhongwei.yao@arm.com>
Zhou Peng <p@ctruple.cn>
Ziad Hatahet <hatahet@gmail.com>
Ziheng Liu <lzhfromustc@gmail.com>
Zorion Arrizabalaga <zorionk@gmail.com>
<a.maksadbek@gmail.com>
<max.faceless.frei@gmail.com>
<hagen1778@gmail.com>
<tbunyk@gmail.com>
<faxriddinjon@gmail.com>
<zs349596@gmail.com>
<bronze1man@gmail.com>
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```

Martin Spier <spiermar@gmail.com>

Taco de Wolff <tacodewolff@gmail.com>

Andrew Hunter <andrewhhunter@gmail.com>

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1.333 giflib 5.2.1

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1.334 ipmi-tool 1.8.18

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1.335 classgraph 4.8.69

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1.336 libjpeg 8d

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This package was created by Mark Mickan <mmickan@debian.org> from sources which can be found at <ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>

It is partly based on the libjpeg6a package originally put together by Andy Guy <awpguy@acs.ualgary.ca> and later maintained by Mark Mickan.

Current Debian maintainer is Bill Allombert <ballombe@debian.org>.

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/package-info.java

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolSubpageMetric.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/AbstractUnsafeSwappedByteBuf.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnpooledDuplicatedByteBuf.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolChunkMetric.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnsafeByteBufUtil.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolArenaMetric.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PoolChunkListMetric.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnpooledUnsafeHeapByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnpooledSlicedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PooledUnsafeHeapByteBuf.java

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/AbstractSearchProcessorFactory.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/MultiSearchProcessor.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/SearchProcessorFactory.java

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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/MultiSearchProcessorFactory.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/SearchProcessor.java

* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/search/KmpSearchProcessorFactory.java

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jar/io/netty/buffer/ByteBufAllocatorMetricProvider.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/ByteBufAllocatorMetric.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
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jar/io/netty/buffer/UnpooledDirectByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/ByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/ReadOnlyByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/SwappedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/DuplicatedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/ByteBufOutputStream.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/PoolChunk.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/UnpooledHeapByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/PoolArena.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/UnpooledUnsafeDirectByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/package-info.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/CompositeByteBuf.java
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jar/io/netty/buffer/PoolSubpage.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/Unpooled.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
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jar/io/netty/buffer/ByteBufAllocator.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/PooledDirectByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/SlicedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/PoolChunkList.java
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jar/io/netty/buffer/ByteBufUtil.java
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jar/io/netty/buffer/UnpooledByteBufAllocator.java
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jar/io/netty/buffer/ByteBufInputStream.java
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jar/io/netty/buffer/AbstractByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-
jar/io/netty/buffer/PooledByteBuf.java
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jar/io/netty/buffer/AbstractByteBufAllocator.java
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* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/AbstractUnpooledSlicedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/WrappedCompositeByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/WrappedUnpooledUnsafeDirectByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/PooledDuplicatedByteBuf.java
* /opt/ws_local/PERMITS_SQL/1072948616_1595240775.72/0/netty-buffer-4-1-51-final-sources-jar/io/netty/buffer/UnpooledUnsafeNoCleanerDirectByteBuf.java

1.339 spring-orm 5.2.8.RELEASE

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* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/HibernateSystemException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/support/SharedEntityManagerBean.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/JpaVendorAdapter.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/ConfigurableJtaPlatform.java

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* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/DefaultJpaDialect.java
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* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/persistenceunit/SpringPersistenceUnitInfo.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/vendor/HibernateJpaSessionFactoryBean.java

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jar/org/springframework/orm/hibernate5/SpringBeanContainer.java
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jar/org/springframework/orm/hibernate5/SessionFactoryUtils.java
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* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/persistenceunit/PersistenceUnitManager.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/JpaOptimisticLockingFailureException.java
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jar/org/springframework/orm/jpa/EntityManagerProxy.java
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jar/org/springframework/orm/jpa/EntityManagerFactoryInfo.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/persistenceunit/PersistenceUnitPostProcessor.java
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jar/org/springframework/orm/jpa/JpaSystemException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/persistenceunit/ClassFileTransformerAdapter.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/SpringSessionSynchronization.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/SpringJtaSessionContext.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/vendor/SpringHibernateJpaPersistenceProvider.java
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jar/org/springframework/orm/jpa/support/PersistenceAnnotationBeanPostProcessor.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/HibernateTransactionManager.java
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- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/SessionHolder.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/SpringFlushSynchronization.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/EntityManagerHolder.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/vendor/EclipseLinkJpaDialect.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/persistenceunit/PersistenceUnitReader.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/HibernateExceptionTranslator.java
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- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/LocalEntityManagerFactoryBean.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/hibernate5/support/OpenSessionInViewInterceptor.java
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- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/jpa/LocalContainerEntityManagerFactoryBean.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-jar/org/springframework/orm/ObjectRetrievalFailureException.java
- * /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-

jar/org/springframework/orm/jpa/persistenceunit/DefaultPersistenceUnitManager.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/AbstractEntityManagerFactoryBean.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/ObjectOptimisticLockingFailureException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/vendor/EclipseLinkJpaVendorAdapter.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/support/HibernateDaoSupport.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/vendor/AbstractJpaVendorAdapter.java
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jar/org/springframework/orm/hibernate5/HibernateOptimisticLockingFailureException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/HibernateJdbcException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/hibernate5/HibernateObjectRetrievalFailureException.java
* /opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
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*/opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/persistenceunit/SmartPersistenceUnitInfo.java
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*/
/**
* Create a transactional EntityManager proxy for the given EntityManagerFactory.
* @param emf the EntityManagerFactory to obtain EntityManagers from as needed
* @param properties the properties to be passed into the
* { @code createEntityManager } call (may be { @code null })
* @param entityManagerInterfaces the interfaces to be implemented by the
* EntityManager. Allows the addition or specification of proprietary interfaces.
* @return a shareable transactional EntityManager proxy
*/
```

Found in path(s):

```
*/opt/cola/permits/1135888122_1613626080.95/0/spring-orm-5-2-8-release-sources-
jar/org/springframework/orm/jpa/SharedEntityManagerCreator.java
```

1.340 springdoc-openapi-common 1.5.9

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1.341 curl 7.50.1

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1.346 jq 1.4

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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker07.java

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketCloseStatus.java

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/CloseWebSocketFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionFilter.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolConfig.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocket00FrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshakerFactory.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker13.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerProtocolHandshakeHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/CorruptedWebSocketFrameException.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker00.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerProtocolHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionFilterProvider.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketDecoderConfig.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker08.java

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jar/io/netty/handler/codec/spdy/SpdyHeaderBlockDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/ServerCookieEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerFrameDeflateDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaderBlockZlibDecoder.java
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jar/io/netty/handler/codec/spdy/SpdyFrameDecoderDelegate.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketClientExtension.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketServerExtensionHandshaker.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketServerExtension.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaderBlockRawDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateClientExtensionHandshaker.j
ava
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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jar/io/netty/handler/codec/http/websocketx/extensions/compression/WebSocketServerCompressionHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateServerExtensionHandshaker.
java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtension.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-

jar/io/netty/handler/codec/spdy/SpdyProtocolException.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/rtsp/RtspHeaderNames.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/package-info.java
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jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateFrameServerExtensionHandshaker.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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jar/io/netty/handler/codec/spdy/SpdyFrameEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/Utf8FrameValidator.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerFrameDeflateEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateFrameClientExtensionHandshaker.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/rtsp/RtspHeaderValues.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/WebSocketClientCompressionHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/HttpMessageUtil.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionData.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyFrameCodec.java
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketScheme.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpContentDecompressor.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/package-info.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/InterfaceHttpPostRequestDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/HttpPostRequestDecoder.java
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/DiskAttribute.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpMethod.java
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* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/InterfaceHttpData.java
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- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/FullHttpRequest.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyDataFrame.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyVersion.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/DefaultFullHttpResponse.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySettingsFrame.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyGoAwayFrame.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cors/package-info.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockRawEncoder.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolHandler.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketFrameAggregator.java
- * /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-

jar/io/netty/handler/codec/spdy/SpdyHttpDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHttpCodec.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaders.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/DefaultFullHttpRequest.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyStreamFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyPingFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdySynStreamFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdySynReplyFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyRstStreamFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/ComposedLastHttpContent.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolHandshakeHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyGoAwayFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdySessionHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyHeaders.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/FullHttpRequest.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketFrameDecoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyCodecUtil.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaderBlockEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/DefaultSpdyHeadersFrame.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaderBlockZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyHeaderBlockJZlibEncoder.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/spdy/SpdyStreamStatus.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketProtocolHandler.java
* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-

jar/io/netty/handler/codec/spdy/SpdyHeadersFrame.java

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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/FileUploadUtil.java

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpServerKeepAliveHandler.java

* /opt/ws_local/PERMITS_SQL/1072411888_1594999339.26/0/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketChunkedInput.java

1.349 swagger-integration 2.1.9

1.349.1 Available under license :

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Manifest-Version: 1.0

Bundle-Description: swagger-integration

Automatic-Module-Name: io.swagger.v3.oas.integration

Bundle-License: "Apache License 2.0";link="http://www.apache.org/licenses/LICENSE-2.0.html"

package: io.swagger

Bundle-SymbolicName: io.swagger.core.v3.swagger-integration

implementation-version: 2.1.9

Built-By: runner

Bundle-ManifestVersion: 2

Bundle-DocURL: <https://github.com/swagger-api/swagger-core/modules/swagger-integration>

Import-Package: com.fasterxml.jackson.annotation;version="[2.12,3)",com

m.fasterxml.jackson.databind;version="[2.12,3)",com.fasterxml.jackson

.databind.annotation;version="[2.12,3)",io.github.classgraph;version=

```
"[4.8,5)",io.swagger.v3.core.converter;version="[2.1,3)",io.swagger.v3.core.jackson;version="[2.1,3)",io.swagger.v3.core.util;version="[2.1,3)",io.swagger.v3.oas.annotations;version="[2.1,3)",io.swagger.v3.oas.integration,io.swagger.v3.oas.integration.api,io.swagger.v3.oas.models;version="[2.1,3)",io.swagger.v3.oas.models.media;version="[2.1,3)",org.apache.commons.lang3;version="[3.7,4)",org.apache.commons.lang3.tuple;version="[3.7,4)",org.slf4j;version="[1.7,2)"
Require-Capability: osgi.ee;filter="(&(osgi.ee=JavaSE)(version=1.8))"
Bundle-Developers: fehguy;email="fehguy@gmail.com";name="Tony Tam",web
ron;email="webron@gmail.com";name="Ron Ratovsky"
url: https://github.com/swagger-api/swagger-core/modules/swagger-integration
mode: development
Export-Package: io.swagger.v3.oas.integration;uses:="com.fasterxml.jac
kson.databind,io.swagger.v3.core.converter,io.swagger.v3.core.util,io
.swagger.v3.oas.integration.api,io.swagger.v3.oas.models,org.apache.c
ommons.lang3.tuple,org.slf4j";version="2.1.9",io.swagger.v3.oas.integ
ration.api;uses:="com.fasterxml.jackson.databind,io.swagger.v3.core.c
onverter,io.swagger.v3.oas.integration,io.swagger.v3.oas.models";vers
ion="2.1.9"
Bundle-Name: swagger-integration
Bundle-Version: 2.1.9
Bundle-SCM: url="https://github.com/swagger-api/swagger-core/modules/s
wagger-integration",connection="scm:git:git@github.com:swagger-api/sw
agger-core.git/modules/swagger-integration",developer-connection="scm
:git:git@github.com:swagger-api/swagger-core.git/modules/swagger-inte
gration",tag=HEAD
Created-By: Apache Maven 3.6.3
Build-Jdk: 1.8.0_282
```

Found in path(s):

* /opt/cola/permits/1165124366_1631831566.71/0/swagger-integration-2-1-9-jar/META-INF/MANIFEST.MF

1.350 glibc 2.19

1.350.1 Available under license :

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Version 2.1, February 1999

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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a

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```
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1.351 glib 2.28.8

1.352 icu 65

1.352.1 Available under license :

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## Commands to generate dependency files
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)

## Flags for position independent code
SHAREDLIBCFLAGS = -fPIC
SHAREDLIBCXXFLAGS = -fPIC
SHAREDLIBCPPFLAGS = -DPIC

## Additional flags when building libraries and with threads
THREADSCPPFLAGS = -D_REENTRANT
LIBCPPFLAGS =

## Compiler switch to embed a runtime search path
LD_RPATH=
LD_RPATH_PRE= -Wl,-rpath,

## Compiler switch to embed a library name
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))

## Shared library options
LD_SOOPTIONS= -Wl,-Bsymbolic

## Shared object suffix
SO = so

## Non-shared intermediate object suffix
STATIC_O = ao

## Compilation rules
%.${STATIC_O}: $(srcdir)/%.c
$(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<
```

```
%.o: $(srcdir)/%.c
$(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<

%. $(STATIC_O): $(srcdir)/%.cpp
$(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<
%.o: $(srcdir)/%.cpp
$(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<
```

Dependency rules

```
%.d: $(srcdir)/%.c
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.c) $< \
| sed "s^\($*\)\.o[ :]*/\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'
```

```
%.d: $(srcdir)/%.cpp
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.cc) $< \
| sed "s^\($*\)\.o[ :]*/\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'
```

Versioned libraries rules

```
%. $(SO). $(SO_TARGET_VERSION)_MAJOR): %. $(SO). $(SO_TARGET_VERSION)
$(RM) $@ && ln -s ${<F} $@
%. $(SO): %. $(SO). $(SO_TARGET_VERSION)_MAJOR
$(RM) $@ && ln -s ${*F}. $(SO). $(SO_TARGET_VERSION) $@
```

Bind internal references

```
# LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic
```

```
# Dependencies [i.e. map files] for the final library
BIR_DEPS=
```

```
## Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =
```

```
## End BSD-specific setup
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```

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

```
/**
* Determines if the { @link #getAuthentication() } has permission to access the target
* given the permission
* @param target the target domain object to check permission on
* @param permission the permission to check on the domain object (i.e. "read",
* "write", etc).
```

```
* @return true if permission is granted to the { @link #getAuthentication() }, else
* false
*/
```

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```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/Transient.java
```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/ReactiveUserDetailsPasswordService.java
```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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```

```
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jar/org/springframework/security/scheduling/DelegatingSecurityContextTaskScheduler.java
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authorization/AuthorityReactiveAuthorizationManager.java
```

```
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jar/org/springframework/security/jackson2/UnmodifiableListDeserializer.java
```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/JdbcUserDetailsManager.java
```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/DefaultMethodSecurityExpressionHandler.java
```

```
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/KeyBasedPersistenceTokenService.java
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/LdapShaPasswordEncoder.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableListMixin.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextCallable.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextRunnable.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PrePostAdviceReactiveMethodInterceptor.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/CachingUserDetailsService.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Md4PasswordEncoder.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/DelegatingPasswordEncoder.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/BadCredentialsExceptionMixin.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Pbkdf2PasswordEncoder.java
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*/
/**
*
* @param authentication represents the user in question. Should not be null.
* @param targetDomainObject the domain object for which permissions should be
* checked. May be null in which case implementations should return false, as the null
* condition can be checked explicitly in the expression.
* @param permission a representation of the permission object as supplied by the
* expression system. Not null.
* @return true if the permission is granted, false otherwise
*/
```

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```
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authorization/AuthorizationDecision.java
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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jar/org/springframework/security/core/parameters/P.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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/**

* Base64 encoder which is a reduced version of Robert Harder's public domain

* implementation (version 2.3.7). See <a

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* @author Luke Taylor

* @since 3.0

* @deprecated Use java.util.Base64

*/

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/codec/Base64.java

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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UsernamePasswordAuthenticationTokenDeserializer.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UserDeserializer.java
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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyUtils.java
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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/bcrypt/BCryptPasswordEncoder.java

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*/

/**

* A token issued by { @link TokenService }.

*

* <p>

* It is important that the keys assigned to tokens are sufficiently randomised and

* secured that they can serve as identifying a unique user session. Implementations of

* { @link TokenService } are free to use encryption or encoding strategies of their choice.

* It is strongly recommended that keys are of sufficient length to balance safety against

* persistence cost. In relation to persistence cost, it is strongly recommended that

* returned keys are small enough for encoding in a cookie.

* </p>

*

* @author Ben Alex

* @since 2.0.1

*/

Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/Token.java

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Found in path(s):

* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/PreInvocationExpressionAttribute.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/AbstractFallbackMethodSecurityMetadataSource.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/SimpleGrantedAuthority.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/event/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/MethodSecurityExpressionRoot.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/P.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/SecurityExpressionRoot.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/package-info.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/InternalAuthenticationServiceException.java
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PostFilter.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/package-info.java
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jar/org/springframework/security/authentication/AccountStatusException.java
* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-
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*/
/**
* Reviews the Object returned from a secure object invocation, being able to
* modify the Object or throw an { @link AccessDeniedException }.
* <p>
* Typically used to ensure the principal is permitted to access the domain object
* instance returned by a service layer bean. Can also be used to mutate the domain object
* instance so the principal is only able to access authorised bean properties or
* Collection elements.
* <p>
* Special consideration should be given to using an AfterInvocationManager
* on bean methods that modify a database. Typically an
* AfterInvocationManager is used with read-only methods, such as
* public DomainObject getById(id). If used with methods that modify a
* database, a transaction manager should be used to ensure any
* AccessDeniedException will cause a rollback of the changes made by the
* transaction.
* </p>
*
* @author Ben Alex
*/
```

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* /opt/ws_local/PERMITS_SQL/1081949690_1599626417.25/0/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/AfterInvocationManager.java

1.354 xorg-randr 1.5.0

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1.355 flyway-core 7.3.1

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jar/org/flywaydb/core/internal/util/DateUtils.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/logging/log4j2/Log4j2Log.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/redshift/RedshiftDatabase.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/db2/DB2Table.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/BaselineResult.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/parser/PositionTrackingReader.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/ClasspathClassScanner.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/Location.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/oracle/OracleSchema.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-

jar/org/flywaydb/core/api/callback/Warning.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/util/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/callback/SimpleContext.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/OperationResult.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/sybasease/SybaseASETTable.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/configuration/ConfigUtils.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/jdbc/WarningImpl.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/db2/DB2Connection.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLConnection.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/parser/Recorder.java
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jar/org/flywaydb/core/internal/logging/apachecommons/ApacheCommonsLogCreator.java
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jar/org/flywaydb/core/internal/logging/apachecommons/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/derby/DerbyParser.java
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jar/org/flywaydb/core/api/output/ErrorOutput.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/classpath/JarUtils.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/android/ContextHolder.java
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jar/org/flywaydb/core/internal/database/sqlite/SQLiteParser.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/oracle/OracleResults.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/ValidateOutput.java
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jar/org/flywaydb/core/internal/scanner/filesystem/FileSystemScanner.java
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jar/org/flywaydb/core/api/output/ValidateResult.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/authentication/ExternalAuthPropertiesProvider.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/package-info.java
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jar/org/flywaydb/core/internal/callback/SqlScriptCallbackFactory.java
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jar/org/flywaydb/core/internal/parser/ParsingContext.java
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jar/org/flywaydb/core/api/migration/Context.java
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jar/org/flywaydb/core/internal/resolver/ResolvedMigrationImpl.java
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jar/org/flywaydb/core/internal/util/CloseableIterator.java
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jar/org/flywaydb/core/internal/exception/FlywayDbUpgradeRequiredException.java
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jar/org/flywaydb/core/internal/database/h2/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/cockroachdb/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
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jar/org/flywaydb/core/api/configuration/Configuration.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/util/AsciiTable.java
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jar/org/flywaydb/core/internal/jdbc/ExecutionTemplateFactory.java
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jar/org/flywaydb/core/internal/resolver/sql/package-info.java
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jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBParser.java
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jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLDatabaseType.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/output/RepairOutput.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/sybasease/SybaseASEJConnectDatabaseType.java
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jar/org/flywaydb/core/internal/database/db2/DB2Type.java
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jar/org/flywaydb/core/api/resolver/package-info.java
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jar/org/flywaydb/core/internal/sqlscript/SqlScriptMetadata.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/authentication/ExternalAuthFileReader.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/MigrationPattern.java
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jar/org/flywaydb/core/internal/info/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/mysql/MySQLTable.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/saphana/SAPHANADatabase.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-jar/org/flywaydb/core/Flyway.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/resource/classpath/ClassPathResource.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/resource/classpath/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/package-info.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/FlywayException.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/callback/Context.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/api/migration/JavaMigration.java
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jar/org/flywaydb/core/api/output/RepairResult.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLDatabase.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/schemahistory/SchemaHistory.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/logging/android/AndroidLogCreator.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/informix/InformixTable.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/classpath/JarFileClassPathLocationScanner.java
* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/derby/DerbyDatabaseType.java

* /opt/cola/permits/1129909879_1612394249.98/0/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptFactory.java

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1.356 ehcache 3.8.1

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org.ehcache.jsr107.internal.Jsr107CacheConfigurationParser

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- * /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/SizedResourcePoolImpl.java
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* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/core/spi/service/FileBasedPersistenceContext.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/core/util/ByteBufferInputStream.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/jsr107/Eh107MXBean.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/xml/CacheResourceConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/EhcacheBase.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/xml/ConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/spi/resilience/StoreAccessException.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/xml/service/DefaultSizeOfEngineConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/xml/exceptions/XmlConfigurationException.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/impl/internal/store/heap/OnHeapStore.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/xml/ServiceCreationConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-
jar/org/ehcache/spi/persistence/StateRepository.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/config/Configuration.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/SuppliedValueStatistic.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/loaderwriter/writebehind/package-info.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/heap/SizeOfEngine.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/event/CacheEventListener.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateHolder.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/KeyCopyBackend.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/ClassInstanceProviderConfiguration.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/sizeof/listeners/EhcacheVisitorListener.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/CacheEvents.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/osgi/OsgiServiceLoader.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/ZeroOperationStatistic.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/Store.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/util/ServiceUtil.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/FloatSerializer.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/AbstractStoreEventDispatcher.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/copy/package-info.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/CacheConfigurationChangeEvent.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/resilience/DefaultResilienceStrategyConfiguration.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/SourceStatistic.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/ConfigurationChangeSupport.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/AbstractResourcePool.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/event/EventOrdering.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/CacheStatistics.java

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/config/CacheRuntimeConfiguration.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/xml/CoreCacheConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Js107CacheConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/package-info.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/Js107LatencyMonitor.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/xml/provider/DefaultSizeOfEngineProviderConfigurationParser.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/spi/event/DefaultCacheEventListenerProvider.java
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Found in path(s):

* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/ArrayUtils.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MemberUtils.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/ClassUtils.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MethodUtils.java
* /opt/cola/permits/1135872409_1613620769.24/0/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/ConstructorUtils.java

1.357 e2fsprogs 1.43.7

1.357.1 Available under license :

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*/

Index: tdbsa/tdb.c

--- tdbsa.orig/tdb.c

+++ tdbsa/tdb.c

@@ -4,11 +4,11 @@ Rev: 23371

Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)

*/

/*

- Unix SMB/CIFS implementation.
+ trivial database library - standalone version

- trivial database library - private includes

-

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This is the Debian GNU/Linux prepackaged version of the EXT2 file
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written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

Sources were obtained from <http://sourceforge.net/projects/e2fsprogs>

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This is the Debian GNU/Linux prepackaged version of the static EXT2 file system consistency checker (e2fsck.static). The EXT2 utilities were written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

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This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:
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#

This is a Makefile stub which handles the creation of BSD shared

```

# libraries.
#
# In order to use this stub, the following makefile variables must be defined.
#
# BSDLIB_VERSION = 1.0
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
    @echo " MKDIR pic"
    @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image: $(BSD_LIB)

$(BSD_LIB): $(OBJS)
    (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
    $(MV) pic/$(BSD_LIB) .
    $(RM) -f ../$(BSD_LIB)
    (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
    `echo $(my_dir) | sed -e 's;lib/;;' /$(BSD_LIB) $(BSD_LIB)`)

install-shlibs install:: $(BSD_LIB)
    @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
    @$(INSTALL_PROGRAM) $(BSD_LIB) \
    $(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
    @-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
    $(RM) -f $(DESTDIR)$$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
    $(RM) -rf pic
    $(RM) -f $(BSD_LIB)
    $(RM) -f ../$(BSD_LIB)

```

This is the Debian GNU/Linux prepackaged version of the Common Error Description library. It is currently distributed together with the EXT2 file system utilities, which are otherwise packaged as "e2fsprogs".

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The most recent officially distributed version can be found at <http://e2fsprogs.sourceforge.net>. If you need to make a distribution, that's the one you should use. If there is some reason why you'd like a more recent version that is still in ALPHA testing (i.e., either using the "WIP" test distributions or one from the hg or git repository from the development branch, please contact me (tytso@mit.edu) before you ship. The release schedules for this package are flexible, if you give me enough lead time.

Theodore Ts'o
23-June-2007

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Gadi Oxman, August 1995

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1.358 cache-api 1.1.1

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1.361 expat 2.2.5

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1.362 Idns 1.7.1

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/* from openssl 4.3p2 compat/strlcpy.c */

/*

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*/

/*

* FILE: sha2.c

* AUTHOR: Aaron D. Gifford - <http://www.aarongifford.com/>

*

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*

* Modified by Jelte Jansen to fit in ldns, and not clash with any
* system-defined SHA code.

* Changes:

* - Renamed (external) functions and constants to fit ldns style

* - Removed _End and _Data functions

* - Added ldns_shaX(data, len, digest) convenience functions

* - Removed prototypes of _Transform functions and made those static

*

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* \$Id: sha2.c,v 1.1 2001/11/08 00:01:51 adg Exp adg \$

*/

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/* From openssh4.3p2 compat/inet_aton.c */

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1.365 jackson-datatype-jsr310 2.11.2

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1.367 classmate 1.5.1

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1.370 icu 66.1-2ubuntu2

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## Commands to generate dependency files  
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)  
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)  
  
## Flags for position independent code  
SHAREDLIBCFLAGS = -fPIC  
SHAREDLIBCXXFLAGS = -fPIC  
SHAREDLIBCPPFLAGS = -DPIC  
  
## Additional flags when building libraries and with threads  
THREADSCPPFLAGS = -D_REENTRANT  
LIBCPPFLAGS =  
  
## Compiler switch to embed a runtime search path  
LD_RPATH=  
LD_RPATH_PRE= -Wl,-rpath,  
  
## Compiler switch to embed a library name  
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))  
  
## Shared library options  
LD_SOOPTIONS= -Wl,-Bsymbolic  
  
## Shared object suffix  
SO = so  
## Non-shared intermediate object suffix  
STATIC_O = ao  
  
## Compilation rules  
%. $(STATIC_O): $(srcdir)/%.c  
$(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<  
%.o: $(srcdir)/%.c  
$(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<  
  
%. $(STATIC_O): $(srcdir)/%.cpp  
$(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<  
%.o: $(srcdir)/%.cpp  
$(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<
```



```

## Dependency rules
%.d: $(srcdir)/%.c
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.c) $< \
| sed "s^\($*\)\.o[ :]*\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

%.d: $(srcdir)/%.cpp
@echo "generating dependency information for $<"
@$(SHELL) -ec '$(GEN_DEPS.cc) $< \
| sed "s^\($*\)\.o[ :]*\1.o $@ : /g\" > $@; \
[ -s $@ ] || rm -f $@'

## Versioned libraries rules

%.${SO}.${SO_TARGET_VERSION_MAJOR}: %.${SO}.${SO_TARGET_VERSION}
$(RM) $@ && ln -s ${<F} $@
%.${SO}: %.${SO}.${SO_TARGET_VERSION_MAJOR}
$(RM) $@ && ln -s ${*F}.${SO}.${SO_TARGET_VERSION} $@

## Bind internal references

# LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic

# Dependencies [i.e. map files] for the final library
BIR_DEPS=

## Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =

## End BSD-specific setup
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Return-Path: <gsf@research.att.com>
X-Original-To: mps@bridge.intra
Delivered-To: mps@bridge.intra
Received: from localhost (localhost [127.0.0.1])
by localhost (Postfix) with ESMTP id B8C814E4F
for <mps@bridge.intra>; Wed, 1 Mar 2006 20:30:53 +0100 (CET)

Received: from mail.bridge.intra ([127.0.0.1])
by localhost (lnx.bridge.intra [127.0.0.1]) (amavisd-new, port 10024)
with LMTP id 05987-03 for <mps@bridge.intra>;
Wed, 1 Mar 2006 20:30:42 +0100 (CET)
Received: from pop.gmx.net (localhost [127.0.0.1])
by mail.bridge.intra (Postfix) with ESMTP id C8C73794D
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Date: Wed, 1 Mar 2006 14:23:45 -0500 (EST)
From: Glenn Fowler <gsf@research.att.com>
Message-Id: <200603011923.OAA86112@raptor.research.att.com>
Organization: AT&T Research
X-Mailer: mailx (AT&T/BSD) 9.9 2005-04-21
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
References: <Pine.LNX.4.44.0603012011250.6386-100000@lnx.bridge.intra>
To: mps@bridge.intra
Subject: Re: testregex licensing question
X-GMX-Antivirus: -1 (not scanned, may not use virus scanner)
X-GMX-Antispam: 0 (Mail was not recognized as spam)
X-GMX-UID: IJF3ZO9DeSEkJ2TcbHQhaXN1IGRvb0Ca
X-Virus-Scanned: by amavisd-new at localhost
Status: RO
X-Status:
X-Keywords:
X-UID: 44736

you may include it directly
retain the testregex.c header comment
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using # comment style to be complete

let me know how it works with your libc
also pass on any new tests you cook up

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> Hello Glenn!

> I would want to add testregex.c and the related *.dat files to the uClibc
> testsuite. uClibc is licensed under LGPL v2.1. I haven't found any
> licensing related info on testregex.

> Is it allowed to use the code there, or should I accomodate the testsuite
> to download the needed files from the original site each time it is ran?

> Thanks, Peter

> --

> Peter S. Mazinger <ps dot m at gmx dot net> ID: 0xA5F059F2
> Key fingerprint = 92A4 31E1 56BC 3D5A 2D08 BB6E C389 975E A5F0 59F2
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1.373 syslinux 6.03

1.373.1 Available under license :

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```

```
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1.374 kmod 23

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1.378 hd-parm 9.38

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1.380 lvm2 2.02.79

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Waldo Bastian <waldo.bastian@intel.com>
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@center Version 2.1, February 1999

@c This file is intended to be included within another document,

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@display

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For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the

application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)
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#
```

1.387 pcre 8.42

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THE BASIC LIBRARY FUNCTIONS

Written by: Philip Hazel
Email local part: ph10
Email domain: cam.ac.uk

University of Cambridge Computing Service,
Cambridge, England.

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1.388 systemd 245.4-4ubuntu3.11

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1.389 glibc 2.31-0ubuntu9.2

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- javaee_web_services_client_1_2.xsd
- javaee_6.xsd
- javaee_web_services_1_3.xsd
- javaee_web_services_client_1_3.xsd
- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd

- javaee_7.xsd
- javaee_web_services_1_4.xsd
- javaee_web_services_client_1_4.xsd
- jsp_2_3.xsd
- web-app_3_1.xsd
- web-common_3_1.xsd
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- javaee_web_services_client_1_2.xsd
- javaee_6.xsd
- javaee_web_services_1_3.xsd
- javaee_web_services_client_1_3.xsd
- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd

- web-fragment_3_0.xsd
- javaee_7.xsd
- javaee_web_services_1_4.xsd
- javaee_web_services_client_1_4.xsd
- jsp_2_3.xsd
- web-app_3_1.xsd
- web-common_3_1.xsd
- web-fragment_3_1.xsd
- javaee_8.xsd
- web-app_4_0.xsd
- web-common_4_0.xsd
- web-fragment_4_0.xsd

may be obtained from:

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- javaee_5.xsd
- javaee_web_services_1_2.xsd
- javaee_web_services_client_1_2.xsd
- javaee_6.xsd
- javaee_web_services_1_3.xsd
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1.392 openssl 1.1.1k

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1.393 lua 5.2.3

1.394 Im-sensors 3.3.1

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That's all there is to it!

Here is a list of the main contributors to lm-sensors version 3.

- * Frodo Looijaard
Original author of libsensors, sensors-detect, sensors and isadump.
- * Merlin Hughes
Original author of sensord.
- * Bob Schlaermann
Dynamic chip feature detection (a.k.a. generic chip support) in
libsensors and sensors.
- * Mark M. Hoffman
Many improvements to the libsensors configuration file scanner.
- * Jean Delvare
New libsensors API, and migration of sensors and sensord thereto.
Many optimizations in libsensors and sensors.
Configuration file converter.
Rewrite of sensors-detect.
Support for multiple configuration files in libsensors.

1.395 junixsocket-native-common 2.3.2

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jar/org/newsclub/lib/junixsocket/common/NarMetadata.java
```

1.396 jaxb-runtime 2.3.3

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1.400 postgres-sql 12.4

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1.401 kerberos 1.11.1

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cmd/krb5/slave/kpropd_rpc.c
lib/gss_mechs/mech_krb5/et/kdb5_err.c
lib/gss_mechs/mech_spnego/mech/gssapiP_spnego.h
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lib/krb5/kadm5/kadm_host_srv_names.c
lib/krb5/kdb/kdb_convert.c
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lib/libgss/g_inquire_cred.c
lib/libgss/g_inquire_names.c
lib/libgss/g_process_context.c
lib/libgss/g_rel_buffer.c
lib/libgss/g_rel_cred.c
lib/libgss/g_rel_name.c
lib/libgss/g_rel_oid_set.c
lib/libgss/g_seal.c
lib/libgss/g_sign.c
lib/libgss/g_store_cred.c
lib/libgss/g_unseal.c
lib/libgss/g_userok.c
lib/libgss/g_utils.c
lib/libgss/g_verify.c
lib/libgss/gssd_pname_to_uid.c
uts/common/gssapi/include/gssapi_err_generic.h
uts/common/gssapi/include/mechglueP.h

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The implementations of GSSAPI mechglue in GSSAPI-SPNEGO in "src/lib/gssapi", including the following files:

lib/gssapi/generic/gssapi_err_generic.et
lib/gssapi/mechglue/g_accept_sec_context.c
lib/gssapi/mechglue/g_acquire_cred.c
lib/gssapi/mechglue/g_canon_name.c
lib/gssapi/mechglue/g_compare_name.c
lib/gssapi/mechglue/g_context_time.c
lib/gssapi/mechglue/g_delete_sec_context.c
lib/gssapi/mechglue/g_dsp_name.c
lib/gssapi/mechglue/g_dsp_status.c
lib/gssapi/mechglue/g_dup_name.c
lib/gssapi/mechglue/g_exp_sec_context.c
lib/gssapi/mechglue/g_export_name.c
lib/gssapi/mechglue/g_glue.c
lib/gssapi/mechglue/g_imp_name.c
lib/gssapi/mechglue/g_imp_sec_context.c
lib/gssapi/mechglue/g_init_sec_context.c
lib/gssapi/mechglue/g_initialize.c
lib/gssapi/mechglue/g_inquire_context.c
lib/gssapi/mechglue/g_inquire_cred.c
lib/gssapi/mechglue/g_inquire_names.c
lib/gssapi/mechglue/g_process_context.c
lib/gssapi/mechglue/g_rel_buffer.c
lib/gssapi/mechglue/g_rel_cred.c
lib/gssapi/mechglue/g_rel_name.c
lib/gssapi/mechglue/g_rel_oid_set.c
lib/gssapi/mechglue/g_seal.c
lib/gssapi/mechglue/g_sign.c
lib/gssapi/mechglue/g_store_cred.c
lib/gssapi/mechglue/g_unseal.c
lib/gssapi/mechglue/g_userok.c
lib/gssapi/mechglue/g_utils.c
lib/gssapi/mechglue/g_verify.c
lib/gssapi/mechglue/gssd_pname_to_uid.c
lib/gssapi/mechglue/mglueP.h
lib/gssapi/mechglue/oid_ops.c
lib/gssapi/spnego/gssapiP_spnego.h
lib/gssapi/spnego/spnego_mech.c

and the initial implementation of incremental propagation, including the following new or changed files:

include/iprop_hdr.h
kadmin/server/ipropd_svc.c
lib/kdb/iprop.x
lib/kdb/kdb_convert.c
lib/kdb/kdb_log.c
lib/kdb/kdb_log.h

lib/krb5/error_tables/kdb5_err.et
kprop/kpropd_rpc.c
kprop/kproplog.c

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```

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@vskip 20pt plus 1fil
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@comment node-name, next, previous, up
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@table @asis

@item GSS-API CFX, SPNEGO, naming extensions, API extensions.

@item KCM credential cache.

@item HDB LDAP backend.

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@heading Vincent Rijmen, Antoon Bosselaers, Paulo Barreto

AES in libcrypto

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rijndael-alg-fst.c

@version 3.0 (December 2000)

Optimised ANSI C code for the Rijndael cipher (now AES)

@author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>

@author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>

@author Paulo Barreto <paulo.barreto@terra.com.br>

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kdc/announce.c

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DES core in libcrypto

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D3DES (V5.09) -

A portable, public domain, version of the Data Encryption Standard.

Written with Symantec's THINK (Lightspeed) C by Richard Outerbridge.
Thanks to: Dan Hoey for his excellent Initial and Inverse permutation code; Jim Gillogly & Phil Karn for the DES key schedule code; Dennis Ferguson, Eric Young and Dana How for comparing notes; and Ray Lau, for humouring me on.

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Windows support

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lib/hcrypto/test_dh.c

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 */
```

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```
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/servers/Servers.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/media/Encoding.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/callbacks/Callback.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
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* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/SecurityScheme.java
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jar/io/swagger/v3/oas/annotations/callbacks/Callbacks.java
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jar/io/swagger/v3/oas/annotations/tags/Tag.java
* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-
jar/io/swagger/v3/oas/annotations/security/OAuthFlow.java
```


* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Operation.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameter.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Server.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameters.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlows.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthScope.java

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* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/tags/Tags.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirements.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/Link.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponse.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/ExternalDocumentation.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/DiscriminatorMapping.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponses.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/parameters/RequestBody.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/LinkParameter.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Hidden.java

* /opt/cola/permits/1165124384_1620941199.55/0/swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Content.java

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@item

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@enumerate a

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@item

Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

@item

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@page

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```

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"macmartinized" polygon code copyright 1992 by Eric Haines, erich@eye.com

For the server\util_md5.c component:

```

/*****
* NCSA HTTPd Server
* Software Development Group
* National Center for Supercomputing Applications
* University of Illinois at Urbana-Champaign
* 605 E. Springfield, Champaign, IL 61820
* httpd@ncsa.uiuc.edu
*
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*****/

```

* md5.c: NCSA HTTPd code which uses the md5c.c RSA Code
*
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For the test\zb.c component:

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=====

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Written by Adam Twiss (adam@zeus.co.uk). March 1996

Thanks to the following people for their input:

Mike Belshe (mbelshe@netscape.com)

Michael Campanella (campanella@stevms.enet.dec.com)

*/

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" lang="en" xml:lang="en"><head>
<meta content="text/html; charset=ISO-8859-1" http-equiv="Content-Type" />
<!--
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
    This file is generated from xml source: DO NOT EDIT
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
-->
<title>The Apache License, Version 2.0 - Apache HTTP Server Version 2.4</title>
<link href="/style/css/manual.css" rel="stylesheet" media="all" type="text/css" title="Main stylesheet" />
<link href="/style/css/manual-loose-100pc.css" rel="alternate stylesheet" media="all" type="text/css" title="No Sidebar - Default font size" />
<link href="/style/css/manual-print.css" rel="stylesheet" media="print" type="text/css" /><link rel="stylesheet" type="text/css" href="/style/css/prettify.css" />
<script src="/style/scripts/prettify.min.js" type="text/javascript">
</script>

<link href="/images/favicon.ico" rel="shortcut icon" /></head>
```



```
<body id="manual-page" class="no-sidebar"><div id="page-header">
<p class="menu"><a href="/mod/">Modules</a> | <a href="/mod/directives.html">Directives</a> | <a
href="http://wiki.apache.org/httpd/FAQ">FAQ</a> | <a href="/glossary.html">Glossary</a> | <a
href="/sitemap.html">Sitemap</a></p>
<p class="apache">Apache HTTP Server Version 2.4</p>
</div>
<div class="up"><a href="/"></a></div>
<div id="path">
<a href="http://www.apache.org/">Apache</a> > <a href="http://httpd.apache.org/">HTTP Server</a> > <a
href="http://httpd.apache.org/docs/">Documentation</a> > <a href="/">Version 2.4</a></div><div id="page-
content"><div id="preamble"><h1>The Apache License, Version 2.0</h1>
<div class="toplant">
<p><span>Available Languages: </span><a href="/en/license.html" title="English">&nbsp;en&nbsp;&nbsp;</a></p>
</div>
```

```
<p class="centered">Apache License<br />
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</div>

</div>

<div class="bottomlang">

<p>Available Languages: en </p>

</div><div class="top"></div><div

class="section"><h2>Comments</h2><div

class="warning">Notice:
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moderators if they are either implemented or considered invalid/off-topic. Questions on how to manage the Apache

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<script type="text/javascript"><!--<!--><![CDATA[</><!--</script>

var comments_shortname = 'httpd';

var comments_identifier = 'http://httpd.apache.org/docs/2.4/license.html';

(function(w, d) {

if (w.location.hostname.toLowerCase() == "httpd.apache.org") {

d.write('<div id="comments_thread"></div>');

var s = d.createElement('script');

```

s.type = 'text/javascript';
s.async = true;
s.src = 'https://comments.apache.org/show_comments.lua?site=' + comments_shortname + '&page=' +
comments_identifier;
(d.getElementsByTagName('head')[0] || d.getElementsByTagName('body')[0]).appendChild(s);
}
else {
d.write('<div id="comments_thread">Comments are disabled for this page at the moment.</div>');
}
})(window, document);
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href="/sitemap.html">Sitemap</a></p></div><script type="text/javascript"><!--<!--><![CDATA[<!--<!--
if (typeof(prettyPrint) !== 'undefined') {
prettyPrint();
}
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1.406 bzip2 1.0.8 2

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Julian Seward, jseward@acm.org
bzip2/libbzip2 version 1.0.8 of 13 July 2019

1.407 zlib 1.2.11.dfsg-2ubuntu1

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/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://tools.ietf.org/html/rfc1950> (zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).

*/

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1.408 jansi 1.8

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1.409 linenoise 1.0

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1.410 protobuf 2.4.1

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1.411 python 3.7.3

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1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
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1.6.1	1.6	2001	CNRI	no
2.1	2.0+1.6.1	2001	PSF	no

2.0.1	2.0+1.6.1	2001	PSF	yes	
+-----+					
2.1.1	2.1+2.0.1	2001	PSF	yes	
+-----+					
2.1.2	2.1.1	2002	PSF	yes	
+-----+					
2.1.3	2.1.2	2002	PSF	yes	
+-----+					
2.2 and above	2.1.1	2001-now	PSF	yes	
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A C-program for MT19937, with initialization improved 2002/1/26.
Coded by Takuji Nishimura and Makoto Matsumoto.

Before using, initialize the state by using `init_genrand(seed)`
or `init_by_array(init_key, key_length)`.

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The `:mod:`socket`` module uses the functions, `:func:`getaddrinfo``, and `:func:`getnameinfo``, which are coded in separate source files from the WIDE Project, <http://www.wide.ad.jp/>. ::

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Modified by Jack Jansen, CWI, July 1995:

- Use binascii module to do the actual line-by-line conversion between ascii and binary. This results in a 1000-fold speedup. The C version is still 5 times faster, though.
- Arguments more compliant with Python standard

XML Remote Procedure Calls

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Select kqueue

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SipHash24

The file `:file:`Python/pyhash.c`` contains Marek Majkowski's implementation of Dan Bernstein's SipHash24 algorithm. The contains the following note::

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Original location:

<https://github.com/majek/csiphash/>

Solution inspired by code from:

Samuel Neves (supercop/crypto_auth/siphash24/little)

djb (supercop/crypto_auth/siphash24/little2)

Jean-Philippe Aumasson (<https://131002.net/siphash/siphash24.c>)

strtod and dtoa

The file :file:`Python/dtoa.c`, which supplies C functions dtoa and strtod for conversion of C doubles to and from strings, is derived from the file of the same name by David M. Gay, currently available from <http://www.netlib.org/fp/>. The original file, as retrieved on March 16, 2009, contains the following copyright and licensing notice::

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OpenSSL

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cfuhash

The implementation of the hash table used by the `:mod:`tracemalloc`` is based on the cfuhash project::

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